



PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT : J. Campbell et al.  
SERIAL NO : 10/074,896  
FILED : February 13, 2002  
TITLE : POULTRY FEED SUPPLEMENT FOR INCREASING  
POULTRY BREAST MEAT WEIGHT

Grp./A.U. : 1632  
Examiner : VALARIE E. BERTOGLIO  
Docket No. : 1828.003US1

**DECLARATION UNDER 37 C.F.R. §1.132**

Commissioner for Patents  
P.O. Box 1450  
Mail Stop  
Alexandria, VA 22313-1450

Dear Sir:

I, Joy M. Campbell, declare the following:

1. That I am a nutritionist for APC Inc., the assignee of the above-identified patent application. I graduated in 1989 with a Bachelor of Science degree in Dairy Science from Iowa State University, Ames, IA, and in 1992 with a Masters of Science Degree in Animal Sciences from the University of Illinois at Urbana-Champaign, Urbana, IL. I also graduated in 1996 with a Doctorate in Nutritional Sciences from the University of Illinois at Urbana-Champaign, Urbana, IL;

2. That I have been working in the field of Nutritional Science since 1996. My background, work experience, publications, and expertise are described in my curriculum vitae (attached Exhibit A), which I incorporate by reference. Furthermore, I was recently awarded with the ASAS/ADSA Outstanding Young Agribusiness Award, 2003;

3. That I am familiar with the above-identified '896 patent application and with the Office Action mailed August 24, 2006, including U.S. Patent No. 6,086,878 and 6,004,576. I am a named co-inventor on the '576 patent. I make this declaration in support of the patentability of the claims of the '896 application.

4. At my direction, a study was carried out to evaluate plasma proteins delivered via the water on performance and carcass characteristics in broilers.

5. Eighty-eight male one day old Jumbo Cornish X Rock broilers were randomly assigned to treatments. Initial body weight was 38 g. Treatments were applied in a 2 x 2 factorial design consisting of 1) vaccination or no vaccination and 2) serum treated water or untreated water. The broilers were housed as 10 or 11 broilers per pen utilizing a total of 8 pens. Body weight, feed intake and water intake were measured daily. Broilers were offered a commercially available starter and grower diet including 22% and 19% protein, respectively. Serum proteins were mixed with water daily to maintain freshness. The serum concentration in the treated water was altered weekly and consisted of 1.32% (week 1), 0.85% (week 2), 0.45% (week 3), 0.28% (week 4), 0.14% (week 5), and 0.28% (week 6), respectively for each week from days 0-42. The broilers were vaccinated on day 2, day 7, and day 14 with B1B1 New Castles/Bronchitis, IBD, and La Sota New Castles/Bronchitis, respectively. On day 42 of the study, a randomly selected group of 24 broilers representing 6 broilers per treatment were stunned, bled, defeathered, eviscerated, and partitioned to determine carcass characteristics of breast meat, wings, and thighs and legs. Liver and spleen were also weighed at the time of evisceration.

6. Data were analyzed as a factorial design using the GLM procedures of SAS (SAS/STAT Version 6.11 SAS Institute, Cary, NC). Model sum of squares consisted of vaccination and water treatment. Least squares means are reported. No interactions between vaccination or water treatment were noted, thus, main effects are reported. Inclusion of plasma proteins in the water increased ( $P < 0.001$ ) average daily gain (ADG) during the first 3 weeks (day 0-7, 7-14, 14-21) with improvements ( $P < 0.05$ ) overall from day 0-42 compared to the birds offered untreated water. No differences ( $P > 0.10$ ) were observed due to vaccination. Average daily feed intake (ADFI) of birds offered serum containing water was increased ( $P < 0.05$ ) from day 0-7 compared to that of birds offered untreated water. No differences ( $P > 0.10$ ) were observed in average daily intake (ADFI) during the remainder of the study due to water treatment or vaccination. Feed efficiency (G/F) was improved ( $P < 0.05$ ) from day 0-7, 7-14, and 0-14 in birds offered serum containing water compared to that of birds offered untreated water. No differences were observed in G/F during the remainder of the study from

consumption of treated water or vaccination. Water intake was increased ( $P < 0.05$ ) on day 0-7, 7-14, and 0-14 in birds offered the treated water compared to that of birds offered untreated water. Vaccination or water treatments during the remainder of the study did not affect water intake ( $P > 0.10$ ).

7. Carcass characteristics at 42 days are presented in Table 1 and summarized in Table 3. Table 3 summarizes the actual compositions observed for the 2.6 kg (control) and 2.8 kg (treated) birds.

**Table 1**  
Main Effect of Water Treatment and Vaccination on  
Carcass Characteristics in Broilers

	Water (Control)	Serum	SEM <sup>b</sup>	P <sup>c</sup>
Live Weight, g	2614.5	2803.33	52.62	0.0196
Cold Carcass Weight, g	1838.76	2012.48	40.04	0.0061
Skinless Breast Meat, g/kg BW <sup>a</sup>	257.87	275.66	3.75	0.0032
Thigh and leg, g/kg BW	315.78	303.97	2.66	0.0052
Wings, g/kg BW	110.31	106.45	1.64	0.1115
Spleen, g/kg BW	1.17	1.24	0.09	0.6088
Liver, g/kg BW	24.76	25	0.78	0.8322

<sup>a</sup>cold carcass body weight

<sup>b</sup>standard error of mean

<sup>c</sup>P value

**Table 2**  
Ross 308 Expected Broiler Body Composition  
(at 42 days for 2.6 kg and 2.8 kg broilers)

			% Change
Live Weight, kg	2.6	2.8	
Carcass weight, kg	1.86	2.01	
Breast meat, kg	0.477	0.520	
Breast meat, % of carcass	25.64	25.87	0.897%
Leg + thigh, kg	0.600	0.6496	
Leg + thigh, % of carcass	32.25	32.32	0.217%

Table 3  
 Ross 308 Observed Broiler Body Composition in Study

	Control	Serum	% Change
Body Weight, kg	2.6	2.8	
Breast meat, % of carcass	25.79	27.57	6.90%
Leg + thigh, % of carcass	31.58	30.40	-3.74%

8. Live weight, cold carcass weight, and skinless breast meat yield were increased ( $P < 0.05$ ) in birds offered the serum containing water compared to that of the birds offered untreated water. Thigh and leg yield were decreased ( $P < 0.01$ ) in birds offered the serum treated water compared to that of the control birds. No differences ( $P > 0.10$ ) in spleen or liver weight were observed due to consumption of treated water.

9. As a broiler chick grows, relative body composition also changes as shown on Table 2. Broiler composition is reported by the breeder to change as live weight changes. This was taken into account when determining the effect of the serum on body composition.

10. In the experiments reported here, live-weight of the broilers at 42 days of age increased from approximately 2.6 kg (control) to 2.8 kg (serum). However, the unexpected response observed is in the change in relative body composition.

11. It is expected that for live weight of a broiler at this age of 2.6 kg or 2.8 kg, the percent of the carcass represented by breast meat and leg + thigh will be greater in the heavier bird, by 0.897% and 0.2317%, respectively. Feeding plasma protein in their water supply changed the expected body composition. Feeding plasma increased body weight at 42 days of age from approximately 2.6 kg to 2.8 kg. However, the change on body composition was significantly different from what was expected. Breast meat represented a greater percent of the carcass weight (27.57%; +6.9%) while the leg + thigh represented a lower percentage of the carcass (30.40%; -3.74%). This difference is an unexpected and commercially beneficial result of our invention.

12. That the undersigned further declares that all statements made herein of her own knowledge are true and that all statements made on information and belief are believed to be true and further that these statements were made with the knowledge that

willful false statements and the like so made are punishable by fine or imprisonment or both under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patents issuing thereon.

Date: Nov. 20, 2006

Joy M. Campbell

Joy M. Campbell, Ph.D.

# **Joy M. Campbell**

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## **Education**

Ph.D. Nutritional Sciences University of Illinois at Urbana-Champaign - 1996  
Thesis Title: Influence of oligosaccharides and fish oil on gastrointestinal tract characteristics and metabolic profiles of humans, pigs, and rats.  
Advisor: Dr. George C. Fahey, Jr. GPA: 5.0/5.0

M.S. Animal Sciences University of Illinois at Urbana-Champaign - 1992  
Thesis Title: Niacin kinetics in lactating dairy cattle supplemented with nicotinic acid or nicotinamide.  
Advisor: Dr. Michael R. Murphy GPA: 5.0/5.0

B.S. Dairy Science Iowa State University, Ames, IA - 1989  
Advisor: Dr. M. Douglas Kenealy GPA: 3.3/4.0

## **Work Experience**

4/97 - present Nutritionist: APC Inc., Ankeny, IA  
Research and product development and technical service towards animal health and nutrition in multiple species both domestically and internationally.

6/96- 4/97 Postdoctoral Associate: Swine Nutrition, Iowa State University, Ames, IA  
Nutritional research of value-added corn for swine nutrition working with Dr. Tim Stahly.

1/95 - 5/95 Teaching Assistant: Agronomy Department, University of Illinois at Urbana-Champaign, Urbana, IL  
Graduate course: Design and Analysis of Biological Experiments

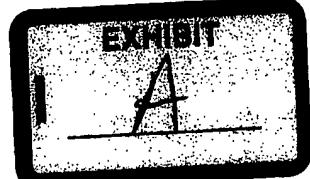
8/93 -12/93 Teaching Assistant: Animal Science Department, University of Illinois at Urbana-Champaign, Urbana, IL  
Graduate course: Techniques in Animal Nutrition Research

1/90 - 5/90 Pet Food Nutrition Internship: Calreco, Inc., Van Nuys, CA  
Nutrition technician assisting with research projects, animal (cat) care, and management of palatability trial input and distribution using a computerized record keeping system

1/88 - 12/89 Lab Assistant: Ruminant Nutrition, Iowa State University, Ames, IA  
Various laboratory analyses, sample collection, and conducting an independent research trial

8/87 - 12/87 Animal Caretaker/Records Assistant: Iowa State University Dairy Farm, Ames, IA  
Animal care and animal record keeping

5/87 - 8/87 Assistant Herdsman: Maddox Dairy, Burrell, CA  
Animal care and herd health of dairy



5/86 - 8/86 Sales Clerk: Crossroads Feed Service, Beebeetown, IA  
Customer service with products and cash register

### **Honors and Awards**

Post-graduate

- ASAS/ADSA Outstanding Young Agribusiness Award, 2003

at University of Illinois

- Jonathan Baldwin Turner Graduate Fellowship, 1992-95
- University Fellowship, 1991-92
- Research Assistantship, 1990-91

at Iowa State University

- Graduated with Honors from ISU, 1989
- Margaret L. Weatherspoon Scholarship, 1989
- Lyle B. McBride III Scholarship, 1989
- O.R. Bentley Scholarship, 1989
- George Gund Independent Study Scholarship, 1988
- Outstanding Sophomore and Senior in Dairy Science, 1988, 1989
- Thorvald J. Andersen Scholarship, 1987, 1988
- College of Agriculture Scholarship, 1986
- ISU Dairy Special Youth Fund Award, 1986
- Admitted to ISU with Recognition and Award, 1986

### **Professional and Honorary Societies**

- American Institute of Nutrition
- American Society of Animal Science
- American Dairy Science Association
- American Association of Swine Veterinarians
- Poultry Science
- World Aquaculture Society
- Amercian Chemical Society
- Sigma Xi
- Gamma Sigma Delta
- Alpha Zeta
- Sigma Alpha
- ISU Honors Program

### **Post Graduate Professional Training**

- Fundamentals of Immunology
- Patent Law Class
- Advanced Excel Training
- Communication and Interpersonal Skills: A Seminar for IT and Technical Professionals

## Publication Record

### Peer-Reviewed Journal Articles

Campbell, J.M., M.R. Murphy, R.A. Christensen, and T.R. Overton. 1994. Kinetics of niacin supplements in lactating dairy cows. *J. Dairy Sci.* 77:566-575.

Pollack, J., J.M. Campbell, S.M. Potter, and J.W. Erdman, Jr. 1994. Mongolian gerbils (*Meriones unguiculatus*) absorb β-carotene intact from a test meal. *J. Nutr.* 124:869-873.

Campbell, J.M., L.L. Bauer, G.C Fahey, Jr., A.J.C.L. Hogarth, B.W. Wolf, and D.E Hunter. 1997. Selected fructooligosaccharide (1-ketose, nystose, and 1<sup>F</sup>-β-fructofuranosylnystose) composition of foods and feeds. *J. Agric. Food Chem.* 45:3076-3082.

Campbell, J.M., G.C. Fahey, Jr., and B.W. Wolf. 1997. Selected indigestible oligosaccharides affect large bowel mass, cecal and fecal short chain fatty acids, pH, and microflora in rats. *J. Nutr.* 127:130-136.

Campbell, J.M., G.C. Fahey, Jr., C.A. Lichtensteiger, S.J. DeMichele, and K.A. Garleb. 1997. An enteral formula containing fish oil, indigestible oligosaccharides, gum arabic, and antioxidants affect plasma and colonic phospholipid fatty acid and prostaglandin profiles in pigs. *J. Nutr.* 127:137-145.

Campbell, J.M., G.C. Fahey, Jr., S.J. DeMichele, and K.A. Garleb. 1997. Metabolic characteristics of healthy adult males as affected by ingestion of a liquid nutritional formula containing fish oil, oligosaccharides, gum arabic, and antioxidant vitamins. *Food and Chemical Toxicology* 35:1165-1176.

Campbell, J.M. and G.C. Fahey, Jr. 1997. Psyllium and methylcellulose fermentation properties in relation to insoluble and soluble fiber standards. *Nutr. Res.* 17:619-629

Campbell, J.M., E.A. Flickinger, and G.C. Fahey, Jr. 1997. A comparative study of dietary fiber methodologies using pulsed electrochemical detection of monosaccharide constituents. *Seminars in Food Analysis* 2:43-53.

Flickinger, E.A., J.M. Campbell, L.G. Schmitt, and G.C. Fahey, Jr. 1998. Selected lignosulfate fractions affect growth performance, digestibility, and cecal and colonic properties in rats. *J. Anim. Sci.* 76:1626-1635.

Hussein, H.S., J.M. Campbell, L.L. Bauer, G.C. Fahey, Jr., A.J.C.L. Hogarth, B.W. Wolf, and D.E. Hunter. 1998. Selected fructooligosaccharide composition of petfood ingredients. *J. Nutr.* 128:2803S-2805S.

Erickson, P.S., M.S. Murphy, J.M. Campbell, and S.W. Nombekela. 2000. Lasalocid supplementation of dairy cow diets in early lactation. *Professional Animal Scientist* 16:196-201.

Jiang, R., X. Chang, B. Stoll, K.J. Ellis, R.J. Shypailo, E. Weaver, J. Campbell, and D.G. Burrin. 2000. Dietary plasma protein is used more efficiently than extruded soy protein for lean tissue growth in early-weaned pigs. *J. Nutr.* 130:2016-2019.

Jiang, R., X. Chang, B. Stoll, M.Z. Fan, J. Arthington, E. Weaver, J. Campbell, and D.G. Burrin. 2000. Dietary plasma protein reduces small intestinal growth and lamina propria cell density in early weaned pigs. *J. Nutr.* 130:21-26.

Steidinger, M.U., R.D. Goodband, M.D. Tokach, S.S. Dritz, J.L. Nelssen, L.J. McKinney, B.S. Borg, and J.M. Campbell. 2000. Effects of pelleting and pellet conditioning temperatures on weaning pig performance. *J. Anim. Sci.* 78:3014-3018.

Steidinger, M.U., R.D. Goodband, M.D. Tokach, J.L. Nelssen, S.S. Dritz, B.S. Borg, and J.M. Campbell. 2002. Effects of providing a water-soluble globulin in drinking water and diet complexity on the growth performance of weanling pigs. *J. Anim. Sci.* 80:3065-3072.

Campbell, J.M., J.D. Quigley, L.E. Russell, and M.T. Kidd. 2003. Effect of spray-dried bovine serum on intake, health and growth of broilers housed in different environments. *J. Anim. Sci.* 81:2776-2782.

Quigley, J.D., III, J.M. Campbell, J. Polo, and L.E. Russell. 2004. Effects of spray-dried animal plasma on intake and apparent digestibility in dogs. *J. Anim. Sci.* 82:1685-1692.

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Campbell, J.M., J.D. Quigley, III, L.E. Russell, and L.D. Koehnk. 2004. Efficacy of spray-dried bovine serum on health and performance of turkeys challenged with *Pasteurella multocida*. *J. Appl. Poult. Res.* 13:388-393.

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Pérez-Bosque, A., C Pelegrí, M. Vicario, M. Castell, L. Russell, J.M. Campbell, J.D. Quigley, III, J. Polo, C. Amat, and M. Moretó. 2004. Dietary plasma protein affects the immune response of weaned rats challenged with *S. aureus* superantigen B. *J. Nutr.* 134:2667-2672.

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Bregendahl, K., D.U. Ahn, D.W. Trampel, and J.M. Campbell. 2005. Effects of dietary spray-dried bovine plasma protein on broiler growth performance and breast-meat yield. *J. Appl. Poult. Res.* 14:560-568.

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### Proceedings Papers

Campbell, J.M., E. Weaver, L. Russell, and F. Chi. 1998. Impact of spray-dried plasma on post-weaning diarrhea and performance in weanling pigs. American Association of Swine Practitioners. Pp. 223-227.

Borg, B.S., J.M. Campbell, H. Koehnk, L.E. Russell, D.U. Thomson, and E.M. Weaver. 1999. Effects of a water soluble plasma protein product on weanling pig performance and health with and without *Escherichia coli* challenge. Allen D. Leman Swine Conference 26:23-24.

Borg, B.S. and J.M. Campbell. 2000. Opportunities for reducing group weight variation through strategic use of Solutein™ in the nursery. Allen D. Leman Swine Conference 27:19-20.

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Borg, B.S. and J.M. Campbell. 2001. Effects of Solutein™ application to various weight classes of young weaned pigs. American Association of Swine Veterinarians. Pp. 207-210.

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Borg, B.S., J.M. Campbell, J. Polo, L.E. Russell, C. Rodriguez, and J. Rodenas. 2002. Evaluation of the chemical and biological characteristics of spray-dried plasma protein collected from various locations around the world. American Association of Swine Veterinarians. Pp. 97-100.

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Crenshaw, J.D., J.M. Campbell, and D. Quam. 2003. Evidence of gastric ulcer tissue repair in swine offered Solutein™ via the water. American Association of Swine Veterinarians. Pp. 105-109.

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Quigley, J.D., J.M. Campbell, C.J. Hammer, J.D. Crenshaw, L.E. Russell, and J. Polo. 2004. Os efeitos do plasma produzido por "spray-dry" nas dietas de suínos e aves. CBNA March 25-26, 2004. Cascavel, PR pp. 183-196.

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Crenshaw, J.D., J.M. Campbell, L.E. Russell, B.K. Allen, J. Polo, and R.D. Boyd. 2004. Impact of spray-dried plasma proteins on immune system modulation. 20<sup>th</sup> Annual Carolina Swine Nutrition Conference. pp. 27-36.

Crenshaw, J.D., J.M. Campbell, L.E. Russell, and J. Polo. 2004. Proteínas plasmáticas: Mecanismo de ação e uso em leitões, porcas e frangos de corte. CBNA November 10-12, 2004. Campinas, SP pp. 221-236.

Campbell, J.M., T. Donavan, D. Boyd, L. Russell, and J. Crenshaw. 2006. Use of statistical process control analysis to evaluate the effects of spray-dried plasma in gestation and lactation feed on sow productiviey in a PRRS-unstable farm. American Association of Swine Veterinarians. pp. 139-142.

### Abstracts at Professional Meetings

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Campbell, J.M., S.M. Potter, and J.W. Erdman, Jr. 1993. Absorption of  $\beta$ -carotene by the Mongolian gerbil (*Meriones unguiculatus*). FASEB J. 7:A3021.

Murphy, M.R., J.M. Campbell, S.W. Nombekela, and P.S. Erickson. 1993. Effect of lasalocid on dairy cows in early lactation. J. Dairy Sci. 76(Suppl. 1):279.

Campbell, J.M., M.R. Murphy, R.A. Christensen, and T.R. Overton. 1993. Niacin supplement kinetics in lactating dairy cattle. J. Dairy Sci. 76(Suppl. 1):299.

Campbell, J.M., G.C. Fahey, Jr., C.A. Lichtensteiger, K.A. Garleb, and S.J. DeMichele. 1995. Effects of an ulcerative colitis nutritional formula (UCNF) on cecal and colonic mucosal prostaglandin (PG) synthesis in pigs. *Gastroenterology* 108:A789.

Campbell, J.M., G.C. Fahey, Jr., K.A. Garleb, and S.J. DeMichele. 1995. Safety and tolerance of an ulcerative colitis nutritional formula (UCNF) in healthy adults. *Gastroenterology* 108:A789.

Fahey, G.C., Jr., J.M. Campbell, and E.A. Flickinger. 1996. Comparison of dietary fiber methodologies using selected fibrous ingredients and foodstuffs as substrates. *FASEB J.* 10:A524.

Campbell, J.M., G.C. Fahey, Jr., and B.W. Wolf. 1996. Oligosaccharides affect cecal and colonic short chain fatty acids, pH, and microflora in rats. *FASEB J.* 10:A772.

Flickinger, E.A., J.M. Campbell, G.C. Fahey, Jr., A.J.C.L. Hogarth, K.A. Garleb, W.A. Jacobs, and B.W. Wolf. 1996. Determination of fructooligosaccharides in selected feeds using ion chromatography. *FASEB J.* 10:A794.

Zuo, Y., J.M. Campbell, G.C. Fahey, Jr., N.R. Merchen, and N.L. Bajjalieh. 1996. Digestion responses to low oligosaccharide soybean meal incorporation into diets of ileal cannulated dogs. *J. Anim. Sci.* 74(Suppl. 1):186.

Campbell, J.M., G.C. Fahey, Jr. and C.A. Lichtensteiger. 1997. Assessment of inflammation (granulomatous colitis) induced by intramural injection of peptidoglycan-polysaccharide or Freund's adjuvant in the colon of the pig. *FASEB J.* 11:A581.

Hussein, H.S., J.M. Campbell, L.L. Bauer, G.C. Fahey, Jr., L. Hogarth, and B.W. Wolf. 1997. Fructooligosaccharide composition of petfood ingredients. Waltham International Symposium on Pet Nutrition and Health.

Arthington, J.D., T.L. Brown, J.M. Campbell, E.M. Weaver, L.E. Russell, and F. Chi. 1998. USDA edible, red-blood cell based milk replacer do not potentiate the growth of selected bacteria *in vitro*. *J. Anim. Sci.* 76(Suppl. 1):263.

Campbell, J.M., E.M. Weaver, L.E. Russell, F. Chi, and J.D. Arthington. 1998. Evaluation of dietary inclusion of spray-dried plasma proteins (AP 920 and Appetein) on pig performance throughout the nursery. *J. Anim. Sci.* 76(Suppl. 1):180.

Campbell, J.M., E.M. Weaver, L.E. Russell, F. Chi, and J.D. Arthington. 1998. Impact of spray-dried plasma proteins (Appetein and AP 920) on postweaning pig growth performance. *J. Anim. Sci.* 76(Suppl. 1): 180.

Borg, B.S., J.M. Campbell, L.E. Russell, D.U. Thomson, and E.M. Weaver. 1999. Effects of water soluble globulin on the performance of weanling pigs. *J. Anim. Sci.* 77(Suppl. 1):193.

Miller, S.J., J.D. Arthington, J.M. Campbell, B.S. Borg, and D.M. Webel. 1999. Effect of porcine serum concentrate on growth performance and mortality in young pigs. *J. Anim. Sci.* 77(Suppl. 1):56.

Steidinger, M.U., R.D. Goodband, M.D. Tokach, J.L. Nelssen, L.J. McKinney, J.C. Woodworth, B.S. Borg, and J.M. Campbell. 1999. Effects of increasing pellet conditioning temperature of diets containing spray-dried animal plasma on weanling pig performance. *J. Anim. Sci.* 77(Suppl. 1):193.

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In re Von Schickh

Court of Customs and Patent Appeals

Appl. No. 7530

Decided July 7, 1966

United States Patents Quarterly Headnotes

## PATENTS

[1] Patentability-Composition of matter (§ 51.30)  
Assuming claimed process to be *prima facie* obvious from a consideration merely of reactants, media, and steps employed, invention as a whole is unobvious under 35 U.S.C. 103 by reason of increase in yield obtained while using considerably less acid; prior art does not suggest this characteristic; it is unexpected and, being part of invention as a whole, it should be treated under the law as is an unexpected property in compositions.

## PATENTS

### Particular patents-Nitrates

Von Schickh, Production of Cycloaliphatic Nitrates, claims 8 to 13 and 16 of application allowed.

\*300 Appeal from Board of Appeals of the Patent Office.

Application for patent of Otto Von Schickh, Serial No. 640,334, filed Feb. 15, 1957; Patent Office Group 120. From decision rejecting claims 8 to 13 and 16, applicant appeals. Reversed.

Herbert B. Keil and Matthew C. Thompson, both of Chicago, Ill., for appellant.

Clarence W. Moore (Raymond E. Martin of counsel) for Commissioner of Patents.

Before Worley, Chief Judge, and Rich, Martin, Smith, and Almond, Associate Judges.

Rich, Judge.

This appeal is from the decision of the Patent Office Board of Appeals affirming the examiner's rejection of process claims 8-13 and 16 in application serial

No. 640,334, filed February 15, 1957, for "Production of Cycloaliphatic Nitrates." No claim is allowed.

The invention is an improved process for the direct nitration of cycloaliphatic alcohols and becomes clear from a consideration of the claims:

8. A process for the production of cycloaliphatic nitrates from cycloaliphatic alcohols which comprises dissolving a cycloaliphatic alcohol in an inert solvent, mixing the resultant solution with a nitrating acid at a temperature in the range of from about -40 degreesC. to about 20 degreesC., agitating the mixture, and thereafter removing the solvent to recover said cycloaliphatic nitrate.

Claims 9-13 are dependent on claim 8 and add limitations to specific alcohols and resulting nitrates, for example cyclohexanol resulting in cyclohexanol nitrate, as in claim 10. Claim 16 is the same as claim 8 except that the temperature range is from -10 degreesC. to -5 degreesC. and the nitrating acid is defined as "consisting of one part nitric acid and at least about one part sulfuric \*301 acid." According to the specification, the "nitrating acid" is a mixture of concentrated nitric acid and concentrated sulfuric acid, whereby an amount of "about 1 part of nitric acid to 1, 2, 3, or more parts of sulfuric acid may be employed."

The references relied on are:

Kokatnur 2,435,314 Feb. 3, 1948

Kornblum et al., Journal American Chemical Society, 74, page 3077 (1952).

Another reference, relied on by the examiner, was dropped by the board as "less pertinent."

Kornblum et al., discussed in appellant's specification, appears to represent one of the first reports of *directly* nitrating cycloaliphatic alcohols. This reference discloses the production of cyclopentyl nitrate by introducing cyclopentanol into a stirred solution of sulfuric and nitric acids, at approximately -20 degreesC., over a period of thirty minutes. The mixture was stirred for a further fifteen minutes and petroleum ether was added. After

stirring for another five minutes, the mixture was poured onto crushed ice. The organic layer was separated, washed with phosphoric acid and dried over anhydrous sodium sulfate. After removal of the petroleum ether the residue was rectified and a 69% yield of cyclopentyl nitrate was obtained. No mention is made by Kornblum et al. of dissolving the cyclopentyl alcohol in an inert solvent prior to mixing it with the nitrating acids, in which respect the appealed claims distinguish therefrom.

Kokatnur discloses a method of nitrating organic compounds, especially aromatic compounds, by carrying on the nitration reaction in combination with a diluent which is substantially inert to the reacting materials, is substantially immiscible with water, has a suitable boiling point and is *preferably a solvent for the compound to be nitrated* as well as the product of nitration. Except for glycerine, none of the compounds to be nitrated are alcohols. Certain of the diluents disclosed correspond to the inert solvents employed by appellant.

The board said:

After review of the references and arguments submitted, we are constrained to affirm the rejection of the appealed claims as unpatentable over Kornblum et al. in view of Kokatnur. Kokatnur's diluent is described as inert and is a solvent for the compound being nitrated. While this diluent is vaporized during use in Kokatnur's process, the vapors are condensed and refluxed to the reaction zone so that some diluent is always present in the reaction zone. In view of this suggestion in Kokatnur of the use of a diluent which functions as an inert solvent in a nitrating reaction and in further view of the fact noted on page 5 of the Examiner's Answer, that it is fundamental in chemistry that a solvent will moderate a reaction, we are of the view that it would not be unobvious to one skilled in the art to use an inert solvent in Kornblum et al.'s process.

We have considered appellant's affidavit but are not persuaded thereby to reach a conclusion different from that above indicated. While the affidavit shows improved yields, the several experiments are not strictly comparable. Thus, in Experiment 3 the process was conducted at a higher temperature than in Experiment 1 and in Experiment 3 the sulfuric acid was used in greater volume than the nitric acid, whereas in Experiment 1 the two acids were used in equal

volumes.

The affidavit referred to sets forth three experiments: the first is essentially a repetition of Kornblum et al.'s disclosure; the second is the same as the first except that only one-half as much nitric acid and one-half as much sulfuric acid are used, resulting in about one-half the yield; and the third illustrates the present invention wherein about one-third as much sulfuric acid was used as was used by Kornblum et al., a 95% yield being obtained, i.e., about 35% improvement in yield compared with Kornblum et al. even though much less nitrating acid was employed.

Since we think the art of record fails to suggest both what appellant *did* in terms of carrying out the process per se, and what appellant *found* in terms of an improvement in yield, and since we are unable to agree with the board's criticism of appellant's affidavit which otherwise proves statements in the specification alleging these improvements over the prior art, we think the decision of the board should be reversed.

As we view the prior art relied on, Kornblum et al. show that cycloaliphatic alcohols can be *directly* nitrated without great quantities of the alcohol being oxidized to the corresponding ketone or acid-a problem which apparently then went unsolved. However, Kornblum et al.'s procedure was not free from difficulty. Low temperatures were required-the reaction was said to be uncontrollable at 0 degreesC.-\*302 and great lengths of time as well as great quantities of nitrating acid were needed.

Kokatnur was interested in the nitration of organic compounds, but not cycloaliphatic alcohols, indeed, not alcohols at all except for glycerine. His primary interest was in nitrating aromatic compounds. But regardless of the type of compounds being nitrated, what Kokatnur did was to reduce local superheating, thereby controlling or moderating the reaction rate, by *eliminating the need for sulfuric acid* commonly used in nitrating reactions to absorb the water produced from the reaction. This absorption aided in driving the reaction to completion but, in so doing, caused localized heating which in turn caused undesirable effects. Thus, Kokatnur *replaced* the sulfuric acid with a diluent or solvent to form an azeotropic mixture with the water of reaction thereby removing that water at a relatively low temperature. Apparently Kokatnur's high yields can be attributed to this efficient removal of water.

The examiner and board ignore the bulk of Kokatnur's disclosure and emphasize instead a few selected passages from which they generalize that Kokatnur was concerned with moderating a nitration reaction and that he employs a solvent which would dissolve the material being nitrated-all of which is perfectly true-and then conclude that it would be obvious to use Kokatnur's solvents in the reaction of Kornblum et al. With this we disagree.

What we think the combination of references teaches is to *eliminate* the use of sulfuric acid in Kornblum et al. and use a solvent *instead*. It might even be said that the combination suggests the employment of an azeotropic mixture in the Kornblum et al. process. Any way one looks at it, the result is certainly *not* what appellant has done, for the claimed process uses sulfuric acid *in addition to* the organic solvent. We find no suggestion of this in the references.

[1] Even assuming the process to be *prima facie* obvious from a consideration merely to the reactants, media, and steps employed, we think the invention as a whole must be deemed unobvious under 35 U.S.C. 103 by reason of the increase in yield obtained while using considerably less nitrating acid. We find no suggestion of this characteristic of the claimed process. It appears to be quite unexpected and, being part of the invention as a whole, it should be treated under the law as is an unexpected property in compositions. See In re Papesch, 50 CCPA 1084, 315 F.2d 381, 137 USPQ 43.

On the question of whether appellant's affidavit proves the improved yield as alleged, we agree with the board that the experiments are not *strictly* comparable, but we are unable to agree that the deviations referred to are fatal to appellant's case. For example, in view of the large molar excesses of acid employed in all the experiments, we fail to see the significance of the board's point that in Experiment 1, which relates to the Kornblum et al. process, the amount of nitric and sulfuric acids is the same while in Experiment 3, illustrating appellant's invention, it is not. We believe the amount by which they differ in Experiment 3 to be insignificant. At least the record fails to convince us that such a difference *is* significant. Furthermore, it is noted that the amount of both sulfuric and nitric acid is much less in appellant's invention than in the prior art process. As to the ten degree differential in temperatures, this would seem to hinder appellant's process since the higher temperature would, we think, drive the

reaction toward the unwanted competitive reaction of oxidizing the alcohol to the ketone, as appellant points out.

In summary, viewing both what appellant did and what he obtained in light of the prior art relied on, we conclude that the invention as a whole is unobvious within the meaning of 35 U.S.C. 103.

The decision of the board is *reversed*.

Worley, Chief Judge, and Smith, Judge, concur in the result.

Cust. & Pat.App.

150 U.S.P.Q. 300

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In re Shetty

Court of Customs and Patent Appeals

No. 77-515

Decided Nov. 17, 1977

United States Patents Quarterly Headnotes

**PATENTS****[1] Patentability -- Invention -- Specific cases -- Chemical (§ 51.5093)**

It is obvious and there is sufficient motivation to person skilled in chemical or pharmaceutical arts to substitute ethylene link between adamantane ring and amine for structurally-similar prior art methylene link.

**PATENTS****[2] Patentability -- Invention -- In general (§ 51.501)****Patentability -- Invention -- Specific cases -- Chemical (§ 51.5093)**

Fact that claimed method might be inherent in teachings of prior art is immaterial if one of ordinary skill in art would not appreciate or recognize that inherent method; mere hindsight assertion that corresponding dosages of prior art compounds useful for combatting microbial infestation, in light of which claimed compound is obvious, renders claimed method for appetite control obvious is untenable; inherency of advantage and its obviousness are entirely different questions; obviousness cannot be predicated on what is unknown.

**PATENTS****Particular patents -- Adamantane Derivatives**

Shetty, Anorectic Adamantane Derivatives and Method of Using Same, rejection of claim 52 affirmed; rejection of claims 2-5 and 51 reversed.

\*753 Appeal from Patent and Trademark Office Board of Appeals.

Application for patent of Bola Vithal Shetty, Serial No. 171,736, filed Aug. 13, 1971. From decision rejecting claims 2-5, 51, and 52, applicant appeals.

Modified.

Carl A. Hechmer, Jr., and Edward A. Sager, both of Philadelphia, Pa., for appellant.

Joseph F. Nakamura (Jack E. Armore, of counsel) for Commissioner of Patents and Trademarks.

Before Markey, Chief Judge, Rich, Baldwin, and Lane, Associate Judges, and Morgan Ford, Associate Judge, United States Customs Court.

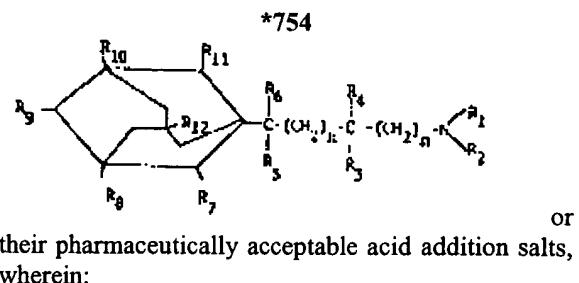
Rich, Judge.

This appeal is from that portion of the July 30, 1976, decision of the Patent and Trademark Office (PTO) Board of Appeals (board) rejecting claims 2-5, 51, and 52 in application serial No. 171,736, filed August 13, 1971, entitled "Anorectic Adamantane Derivatives and Method of Using Same." The board rejected the claims under 35 USC 103 on new grounds, as provided in 37 CFR 1.196(b), as obvious from Brake [FN1] in view of Narayanan, [FN2] Bernstein et al., [FN3] and Bernstein. [FN4] We affirm the rejection of composition claim 52 and reverse the rejection of method claims 51 and 2-5.

*The Invention*

The invention pertains to a method, as defined in claims 51 and 2-5, of curbing appetite in animals by administering certain adamantane compounds. [FN5] The invention also pertains to the unit dosage form of a composition for curbing appetite comprising such an adamantane compound and a pharmaceutically acceptable carrier as defined in claim 52.

In the specification, appellant identifies his claimed compounds as follows:

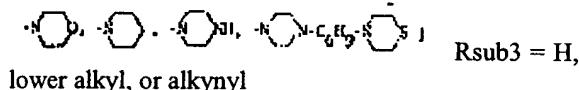


Rsub1 = H, lower alkyl, aralkyl, aralkyl substituted with NHsub2, OH, OCHsub3, halogen, alkyl,

$\text{NO}_{\text{sub}2}$ ; phenoxyalkyl or phenoxyalkyl substituted with  $\text{NH}_{\text{sub}2}$ , OH,  $\text{OCH}_{\text{sub}3}$ , halogen, alkyl, or  $\text{NO}_{\text{sub}2}$ ; acyl such as formyl or acetyl.

$\text{R}_{\text{sub}2}$  = H, lower alkyl, COO-lower alkyl, aralkyl, aralkyl substituted with  $\text{NH}_{\text{sub}2}$ , OH,  $\text{OCH}_{\text{sub}3}$ , halogen, alkyl,  $\text{NO}_{\text{sub}2}$ ; phenoxyalkyl or phenoxyalkyl substituted with  $\text{NH}_{\text{sub}2}$ , OH,  $\text{OCH}_{\text{sub}3}$ , halogen, alkyl, or  $\text{NO}_{\text{sub}2}$ ; acyl such as formyl or acetyl.

$\text{R}_{\text{sub}1}$  and  $\text{R}_{\text{sub}2}$  can be joined together to form, with the nitrogen, a heterocyclic ring (e.g.



$\text{R}_{\text{sub}4}$  = H, lower alkyl, or alkynyl

$\text{R}_{\text{sub}5}$  = H, OH, halogen, or lower alkyl

$\text{R}_{\text{sub}6}$  = H, OH, halogen, or lower alkyl

$\text{R}_{\text{sub}5}$  and  $\text{R}_{\text{sub}6}$  together may represent a carbonyl oxygen

$\text{R}_{\text{sub}7}$  = H, lower alkyl, halogen, hydroxy, alkoxy, amino or substituted amino, trifluoromethyl, sulfamyl, nitro, phenyl

$\text{R}_{\text{sub}8}$ ,  $\text{R}_{\text{sub}9}$ ,  $\text{R}_{\text{sub}10}$ ,  $\text{R}_{\text{sub}11}$ ,  $\text{R}_{\text{sub}12}$  are any of  $\text{R}_{\text{sub}7}$

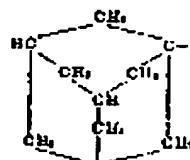
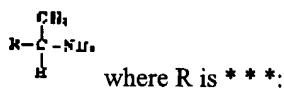
$n = 0$  to 4

$m = 0$  to 4

Independent claim 51 defines the "method of curbing appetite in an animal which comprises administering to the animal an amount effective to curb appetite of a compound" of the above formula.

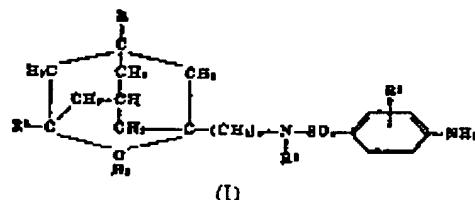
#### The References

Brake describes a process for improving the yield of alpha-methyl multicyclic methylamines, one of which is alpha-methyl-1-adamantanemethylamine, illustrated as:



and is described as being useful as an antiviral agent in animals.

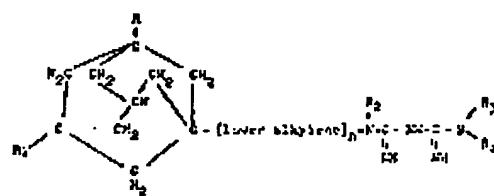
Narayanan teaches adamantyl sulfonamide compounds, useful as antimicrobial agents, e.g., as antiviral agents, of the formula:



wherein  $\text{R}$  and  $\text{R}'$  each is hydrogen, halogen, lower alkyl, phenyl or phenyl-lower alkyl,  $\text{R}''$  is hydrogen or lower alkyl,  $\text{R}'''$  is hydrogen, lower alkyl, lower alkoxy, halogen or halo-lower alkyl and  $n$  is 0, 1 or 2, and salts thereof.

Narayanan also teaches the use of his compounds in dosages corresponding to those of appellant.

Bernstein et al. pertains to adamantyl biguanides of the formula:

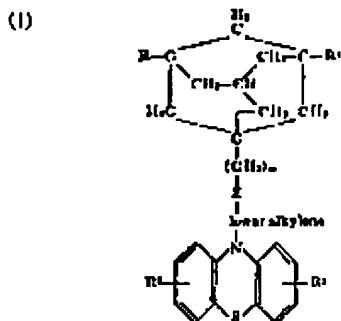


(I) and to acid-addition salts thereof.

In Formula I,  $\text{R}$  and  $\text{R}'$  each is hydrogen, halogen, lower alkyl, phenyl or lower alkoxy,  $\text{R}''$ ,  $\text{R}'''$  and  $\text{R}''''$  each is hydrogen, lower alkyl or phenyl-lower alkyl and  $n$  is 0 or 1.

These compounds are hypoglycemic agents effective in reducing blood sugar content in mammals.

The compounds of the Bernstein patent are illustrated by the following formula:



and to acid-addition and quaternary ammonium salts thereof.

These compounds are adamantyl derivatives of phenothiazines, therapeutically active as central nervous system depressants.

**\*755 The Rejection**

The examiner rejected appellant's claimed composition and method as obvious under 35 USC 103 in view of the teaching in Brake of administering to animals structurally similar adamantane derivatives "analogous" to those claimed. The Bernstein and Narayan an patents were cited to show similar compounds in the art. The examiner reasoned that the composition claim would have been obvious from the prior art because the respective compounds differ merely by a methylene group, i.e., the instant compounds have at least an ethylene link between the adamantane ring and the amine, whereas the prior art compound has a methylene link. This "minor molecular modification" was further asserted to be made obvious by the Bernstein and Narayanan patents, which disclose lower alkylene links between adamantane and other moieties and are directed to pharmaceutical uses.

The board treated the examiner's rejection as relying upon Brake alone and as citing the Bernstein and Narayanan patents to show the state of the art. The board did not sustain the rejection of claims 2-5, 51, and 52 as obvious from Brake alone because Brake's failure to disclose an amount of his compound effective as an antiviral agent renders unobvious the administration of "adjacent homologs of Brake's compound 'in an amount effective to curb appetite' \* \* \*." Similarly, the board did not agree that appellant's composition in an "appetite curbing amount" would have been obvious from Brake alone.

Under 37 CFR 1.196(b), the board made a new ground of rejection under 35 USC 103 for obviousness from Brake in view of the Bernstein and Narayanan patents. The board agreed with the examiner that appellant's compounds having an

ethylene linkage would have been obvious in view of Brake's corresponding adjacent homolog (methylene linkage). Relative to the method claims, the board found sufficient motivation in the prior art to administer Brake's compound and adjacent ethylene "homologs" as antiviral agents, and concluded that administering appellant's compounds in appetite-curbing amounts would have been obvious from Brake and Narayanan since the amounts suggested by Narayanan to achieve antiviral effects encompass the amounts intended and claimed by appellant.

## *The Arguments*

Appellant contends that, after refusing to sustain the examiner's rejection on the basis of Brake alone, the board erred in rejecting the method claims by considering Narayanan in addition to Brake. Appellant argues that Narayanan's reference to dosage for treating viral infection is an improper basis for rejection. It is urged that the board mistakenly assumed that appetite-suppressant effects of appellant's compounds would be readily recognized from treating virus-infected animals with a related compound. It is also urged that the board ignored differences in treatments for viral infection and obesity, and that therefore Narayanan's dosage cannot be said to result in effective anorexia. Relative to the claimed composition, appellant states that there is an appreciable difference between the structure of the compounds of the claim and the prior art compounds, and that the former would not have been obvious because the motivation to make the required structural variation is absent.

The solicitor responds by arguing that in the absence of comparative evidence of any unexpected difference in the properties of appellant's and Brake's compounds, the compounds of the claim would have been obvious from and unpatentable over the structurally closely related compound disclosed by Brake. It is argued that Brake and Narayanan render obvious appellant's pharmaceutical carrier and "unit dosage form." As to the method claims, the solicitor contends that Narayanan discloses adamantly compounds as antiviral agents in dosages that correspond to and would suggest similar and inherently appetite-curbing amounts of the Brake antiviral compound. The solicitor supports the board position that because appellant's compounds are homologous and there is sufficient motivation in the prior art to administer Brake's compound as an antiviral agent, appellant's different purpose does not render the method claims unobvious.

Opinion

We note at the outset that the ethylene linkage of appellant's compound closest to the prior art (beta-(1-adamantyl)-a-methylethylamine) is referred to by the examiner as "analogous" to the methylene linkage of Brake's alpha-methyl-1-adamantanemethylamine and by the board as a "homolog." Since the appellant has not challenged either of these classifications, we proceed on the assumption that he accepts the inference that his compounds, whether homologs or analogs, would be expected to have similar properties to the prior art compound. Whether the adamantyl compounds in question are properly classified according \*756 to the usual definitions of "homolog" and "analog," we shall not consider inasmuch as appellant has not argued the point.

The solicitor has taken the position that absent comparative evidence demonstrating any unexpected difference in the properties of the compounds, the claimed composition would have been obvious from and unpatentable over the structurally closely related compound disclosed in Brake. On the other hand, appellant contends that the presence of the ethylene rather than the methylene group constitutes "an appreciable difference in the claimed compound and the prior art compounds," and relies on In re Taborsky, 502 F.2d 775, 183 USPQ 50 (CCPA 1974) for support of his argument that without some teaching of motivation to make the required molecular variation, a finding of obviousness based on structural similarity is improper.

[1]Regarding this issue of structural similarity, we agree with the solicitor and the PTO position. The examiner noted the difference of a mere methylene group between the compound of the claim and the prior art compounds, cited the Bernstein and Narayanan references showing the state of the art as prior art knowledge of use of lower alkylene links between adamantane and other moieties, and concluded that "this minor molecular modification would clearly be obvious to the pharmaceutical chemist." We do not accept appellant's contention that the adjacent alkylene link in question constitutes an "appreciable difference" in the compounds. We think that a person skilled in chemical and/or pharmaceutical arts would not hesitate to extend the alkylene linkage of the prior art compound. Further, we note that appellant's compound closest to the prior art and its synthetic preparation are disclosed in Narayanan as one of a group of compounds for producing his adamantyl sulfonamide. This leaves no room for doubt that the prior art knowledge renders appellant's compound structurally similar and provides

sufficient motivation to make it.

Moreover, appellant has no basis for relying on Taborsky, *supra*. Unlike the present case, the prior art of record in Taborsky %expressly limited the scope of "halogen" to exclude appellant's claimed fluorosalicylanilide compounds and stated "several disadvantages in practice" of free salicylanilides. 502 F.2d at 781, 183 USPQ at 55 (emphasis supplied). Appellant here has shown no such reason to preclude the conclusion that appellant's compounds are structurally similar to the prior art compounds.

Confronted with PTO evidence of obviousness, appellant has offered no evidence of unobviousness, as by showing an actual difference in properties between his compounds and the prior art compounds. In re Hoch, 57 CCPA 1292, 428 F.2d 1341, 166 USPQ 406 (1970). Appellant merely shows that his novel compounds are appetite suppressants whereas the reference compounds are not so known. Further, appellant has not indicated whether his compounds are antiviral, as is Brake's prior art compound. Presented with such an absence of comparative or other evidence with respect to the properties of the compounds and the claimed composition, we hold that composition claim 52 would have been obvious from and unpatentable over the prior art.

[2]Regarding method claims 51 and 2-5, the solicitor agrees with the board that:

\* \* \* the compounds of claim 51 are obvious from and unpatentable over the corresponding Brake compound and the Narayanan disclosure of a dosage which corresponds to appellant's disclosed appetite curbing dosage (therefore, *inherently* appetite curbing). [Emphasis added.]

We cannot accept this conclusion. The issue here is whether the claimed method of curbing appetite would have been obvious. That appellant's "amount effective to curb appetite" corresponds to or inheres in Narayanan's amount "to combat microbial infestation" does not persuade us of the obviousness of appellant's method. As this court said in In re Naylor, 54 CCPA 902, 905- 06, 369 F.2d 765, 768, 152 USPQ 106, 108 (1966):

[Inherency] is quite immaterial if, as the record establishes here, one of ordinary skill in the art would not appreciate or recognize that inherent result. \* \* \*

\* \* \* we find nothing in the record which would afford one of ordinary skill reason to anticipate that a trial \* \* \* [of the combined prior art teachings] would be successful in producing the polymer recited in the claims.

The Patent Office has failed to show a reasonable expectation, or some predictability, that Brake's compound would be an effective appetite suppressant if administered in the dosage disclosed by Narayanan. The mere hindsight assertion that corresponding dosages render appellant's method obvious is untenable. \*757 Prior to appellant's disclosure, none of the adamantane compounds in any of the references before us suggested a use, much less a dosage, for curbing appetite. What we said in In re Spormann, 53 CCPA 1375, 1380, 363 F.2d 444, 448, 150 USPQ 449, 452 (1966), relative to inherency applies equally here:

As we pointed out in In re Adams, 53 CCPA 996, 356 F.2d 998, 148 USPQ 742 [(1966)], the inherency of an advantage and its obviousness are entirely different questions. That which may be inherent is not necessarily known. Obviousness cannot be predicated on what is unknown.

Accordingly, the decision of the board is *affirmed* as to claim 52 and *reversed* as to claims 51 and 2-5.

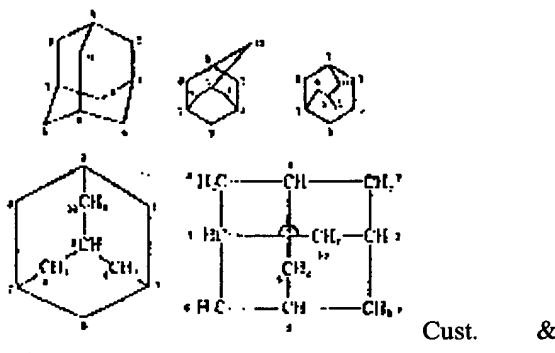
FN1 U.S. Patent No. 3,489,802, issued Jan. 13, 1970, on application serial No. 610,779, filed Jan. 23, 1967.

FN2 U.S. Patent No. 3,501,511, issued Mar. 17, 1970, on application serial No. 661,781, filed Aug. 21, 1967.

FN3 U.S. Patent No. 3,270,036, issued Aug. 30, 1966, on application serial No. 493,899, filed Oct. 7, 1965.

FN4 U.S. Patent No. 3,320,249, issued May 16, 1967, on application serial No. 470,930, filed July 9, 1965.

FN5 Adamantane is the trivial name assigned to tricyclodecane. Its structural formula can be represented in any of the following ways:



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C

In re KATZSCHMANN

Court of Customs and Patent Appeals

Appl. No. 7406

Decided June 24, 1965  
United States Patents Quarterly Headnotes

**PATENTS**

[1] **Patentability--Composition of matter (§ 51.30)**  
*In re Aller*, 105 USPQ 233, recognized that under some circumstances changes such as temperature and concentration or both may impart patentability to a process if particular ranges claimed produce a new and unexpected result.

**PATENTS**

[2] **Affidavits--Distinguishing from references (§ 12.7)**  
**Patentability--Invention--In general (§ 51.501)**  
**Pleading and practice in Patent Office--Rejections (§ 54.7)**

It was not intent of 35 U.S.C. 103 that examiner, Board, or court should substitute their own speculations for factual knowledge of those skilled in the art; where affidavit states facts which are relevant to ultimate determination of legal issue arising under section 103, it must be given careful evaluation to determine whether it factually rebuts the bases upon which examiner predicated his finding of obviousness; such an affidavit may shift burden of proof to examiner to come forward with further support for conclusion of obviousness.

**PATENTS**

**Particular patents--Phthalic Acids**

Katzschmann, Process for the Production of Esters of Phthalic Acids, claims 1 to 8 of application allowed.

\*66 Appeal from Board of Appeals of the Patent Office.

Application for patent of Ewald Katzschmann, Serial No. 24,680, filed Apr. 26, 1960; Patent Office Group 130. From decision rejecting claims 1 to 8,

applicant appeals. Reversed; Worley, Chief Judge, with whom Martin, Judge, joins, dissenting with opinion.

PAUL M. CRAIG, JR., and JAMES E. BRYAN, both of Washington, D.C., for appellant.

CLARENCE W. MOORE (J. E. ARMORE of counsel) for Commissioner of Patents.

Before WORLEY, Chief Judge, and RICH, MARTIN, SMITH, and ALMOND, Associate Judges.

SMITH, Judge.

As an improvement on the process of his U. S. Patent 2,894,978 appellant discovered that undesirable by-products \*67 were reduced and an improved space-time yield was achieved in the production of esters of phthalic acids by 1) using xylenes of 98.5% concentration and 2) using p-xylene or m-xylene. His application for patent on this improved process [FN1] has been refused under 35 U.S.C. 103 as covering but an obvious modification of the process of appellant's Canadian patent No. 557,345, issued May 13, 1958. Appellant states that this patent corresponds to his U.S. patent which was acknowledged to be prior art.

The rejection of claims 1-8 is here on appeal. While differing in scope, it is clear that the claims will stand or fall together. The broadest of these claims is claim 1 which reads as follows:

1. In a process for producing esters of phthalic acids from mixtures of xylene and esters of toluic acids with monovalent alkanols, the steps which comprise oxidizing a mixture of a xylene selected from the group consisting of p-xylene having a concentration of at least 98.5% and m-xylene having a concentration of at least 98.5% and esters of toluic acids with alkanols in the proportion by weight between about 1:3 and, at the most, 1:1 in the liquid phase with an oxygen-containing gas at a temperature between about 80 degreesC and about 250 degrees C in the presence of an oxidation catalyst for a prolonged period of time until the xylenes are substantially completely oxidized.

Claim 6 is more specific in specifying that the alkanol is one having 1 to 4 carbon atoms, and in adding the step of "esterifying the resulting oxidate under pressure." Claims 2 to 5 depend from claim 1, and 7 and 8 depend from claim 6, and each recites variations with respect to known temperature and pressure conditions and to known reactants used in the specific reaction mixture.

In rejecting the claims, the examiner and the board rely upon the disclosure in examples 1 and 2 of the Canadian patent in which 96% p-xylene is used, the position as summarized by the solicitor in his brief here being:

\* \* \* This disclosure was construed by the examiner to mean to one skilled in the art that the degree of purity of the xylene reactant is not critical and that the optimum conditions would be determined by the individual experimenter by routine experimentation.

We think the basic error of the examiner and the board was in failing to consider appellant's claimed subject matter "as a whole" as required by section 103. If nothing more than non-critical percent concentrations of reactants were here involved, perhaps the position of the examiner could be sustained. However, the improved process as a whole as disclosed is restricted to the use either of p-xylene or m-xylene of such concentrations.

We find no teaching in the Canadian patent that the use of *either* p-xylene *or* m-xylene in concentration of 98.5% and above would be expected to improve the results of the disclosed process. To the contrary, we not only find no appreciation of this aspect of the invention in the Canadian patent but we find that in addition to the 96% p-xylene specified in examples 1 and 2, the Canadian patent asserts:

It is, of course, also possible to employ, in place of p-xylene and of the methyl ester of p-toluic acid, equi-molecular amounts of o-xylene or m-xylene and of the methyl esters of o-toluic acid or m-toluic acid. Likewise, a mixture of xylenes, such as a commercial product containing, for instance, 66% of m-xylene, 33% of p-xylene, and the remainder being o-xylene and ethyl benzene, as well as mixtures of the methyl esters of m-toluic acid and p-toluic acid with small amounts of o-toluic acid with also be employed as starting material. \* \* \*

[1] The solicitor has directed our attention to In re

Aller, 42 CCPA 824, 220 F.2d 454, 105 USPQ 233, as a controlling authority in the present situation. As we see it, the Aller case recognized that under some circumstances changes such as temperature and concentration or both "may impart patentability to a process if the particular ranges claimed produce a new and unexpected result." Here, we think the record establishes that appellant's claimed improvements did produce a new and unexpected result. As stated in the specification:

It has now been found that an unobvious and unexpected result in the production of iso- or tere-phthalic acid dimethyl ester is obtained when 98.5 to 100% p- or m-xylol is utilized. The use of such xylols is particularly effective in restricting the formation of by-products. In addition thereto, the yield is high and entirely unexpected when compared to the theoretical yield and the space/time yield.

\*68 The specification also states:

The utilization of xylenes in concentrations of from 98.5 to 100% is of particular significance or value for the end product with regard to the minimization of by-products and the production of polyesters, since the substantial decrease in the formation of by-products and the increase of the theoretical yield due to the increase of the concentration of p- or m-compounds finds a special interest technically.

In addition to the foregoing, the record contains an affidavit dated July 23, 1962, which sets forth facts by one whose stated qualifications certainly establish him as a person of skill in this art. The examiner and the board appear to have given little weight to this affidavit on the issue here, i.e., would the claimed improvements have been obvious to one of ordinary skill in this art. The affidavit contains the following statement of fact:

By means of the present improvement, i.e., by the use of 98.5 to 100

The affidavit also states:

At the time of filing the application upon which the above-mentioned patent is based, a high [-er] quality than 96% p-xylene was not made for industry, or even demanded thereby because it was believed that the last per cent of purity would require too high and uneconomical an

expenditure. The manufacture of industrial amounts of high percent xylenes, particularly p-xylene, was begun only after the discovery of the improvement process of the present application and the demands resulting therefrom. \*\*\*

[2] We do not think it was the intent of section 103 that either the examiner, the board or this court should substitute their own speculations for the factual knowledge of those skilled in the art. Where, as here, an affidavit states facts which are relevant to the ultimate determination of the legal issue arising under section 103, we think it must be given careful evaluation and properly weighed to determine whether it factually rebuts the bases upon which the examiner has predicated his finding of obviousness. Thus an affidavit such as that of record here may well shift the burden of proof to the examiner to then come forward with further support for his conclusion that the invention would have been obvious under the conditions stated in section 103. In other words, we think the affidavit here factually rebutted the Canadian patent as a basis for the asserted obviousness of the claimed invention.

The decision of the board is *reversed*.

FN1 Serial No. 24,680, filed April 26, 1960 for "Process for the Production of Esters of Phthalic Acids."

WORLEY, Chief Judge, dissenting, with whom MARTIN, Judge, joins.

The point which forms the principal reason for my disagreement with the majority opinion is the inordinate weight given appellant's affidavit.

Appellant's specification, as illustrated by the quotations set out by the majority, points out that use of 98.5% to 100% p- or m-xylene results in a decrease in by-product formation as well as yields which are high and "entirely unexpected" when compared to the ordinarily expected theoretical yield and space-time yield. I consider those statements in the specification to be well tempered by appellant's concession in his affidavit, also quoted by the majority, that:

By means of the present improvement, i.e., by the use of 98.5 to 100

\*69 The examiner noted:

\*\*\* The result of using purer materials is precisely that expected, i.e. an increase in the yield with less side-reactions. \*\*\*

and appellant, in his brief before the board, stated

\*\*\* One expects a higher yield when using a purer starting material.

In view of the results expected when one uses purer starting material, it seems to me adequate reason has been provided to do what appellant has done. Weighing all the evidence, I do not find reversible error in the board's conclusion that the subject matter as a whole is obvious to one of ordinary skill. I would affirm.

FN1 Neither appellant nor the Patent Office has furnished a definition of space-time yield from which we can evaluate the merits of the contentions with respect thereto. Perry's Chemical Engineering Handbook, 3rd Edition, states at page 329:

\*\*\* Space velocity is defined to be the volume of gas \*\*\* or liquid passing through a given volume of catalyst space vsubc in unit time divided by the latter, i.e. space velocity V/vsubc . \*\*\* The yield of desired product in unit time per unit volume of catalyst per passage is the space-time yield. This is the product of the fractional conversion F by the space velocity, space-time yield, F(V/vsubc ). Increasing the purity of starting material would necessarily appear to increase the value of at least F in the above equation, thereby increasing space-time yield.

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**C**

In re COSTELLO

Court of Customs and Patent Appeals

No. 8901

Decided June 28, 1973  
United States Patents Quarterly Headnotes**PATENTS****[1] Patentability -- Composition of matter (§ 51.30)**

There is no justification for ignoring applicant's allegations of unexpected results; broad teachings of reference cannot preclude establishment of unobviousness for specific bath compositions not anticipated thereby; evidence of properties such as improved stability, higher rate of deposition, and capacity to satisfactorily plate plastic articles may well provide adequate rebuttal to *prima facie* case established by Patent Office.

**PATENTS****[2] Claims -- Broad or narrow -- Chemical (§ 20.203)****Patentability -- Composition of matter (§ 51.30)**

Method claims broadly drawn to "applying a nickel coating to articles" are not rendered unobvious by showing that plastic substrates may also be coated; hence, method claims still read on obvious subject matter; however, this does not hold true for composition claims; all properties must be considered in determining obviousness of composition.

**PATENTS****Particular patents--Plating Process**

Costello, Plating Process and Bath, claims 6, 10, 11, 22, 24 to 28, and 30 of application allowed; claims 1 to 5, 7 to 9, 12, 13, 16 to 21, 23, 29, and 31 to 35 refused.

\*290 Appeal from Board of Appeals of the Patent Office.

Application for patent of Francis E. Costello, Serial No. 588,725, filed Oct. 24, 1966; Patent Office Group 160. From decision rejecting claims 1 to 13

and 16 to 35, applicant appeals. Affirmed as to claims 1 to 5, 7 to 9, 12, 13, 16 to 21, 23, 29, and 31 to 35; reversed as to claims 6, 10, 11, 22, 24 to 28, and 30.

JOHN F. A. EARLEY, Philadelphia, Pa., and JAMES W. DENT, Arlington, Va., for appellant.

S. WM. COCHRAN (FRED E. MCKELVEY of counsel) for Commissioner of Patents.

Before MARKEY, Chief Judge, RICH, BALDWIN, and LANE, Associate Judges, and ALMOND, Senior Judge.

\*291 MARKEY, Chief Judge.

This appeal is from the decision of the Board of Appeals sustaining the rejection of claims 1-39 in appellant's application serial No. 588,725, [FN1] filed October 24, 1966, for "Plating Process and Bath." At oral argument appellant withdrew the appeal with respect to claims 14, 15 and 36-39. Accordingly, the appeal is dismissed as to these claims. All of the claims remaining under consideration, i.e. claims 1-13 and 16-35, [FN2] were rejected under 35 U.S.C. 103 as unpatentable over Brenner et al. [FN3] Claims 7, 17, 18 and 20 were additionally rejected under 35 U.S.C. 112. We affirm in part and reverse in part.

**The Invention**

The invention relates to an alkaline electroless bath, useful for applying a nickel coating to articles at low temperatures. Such conditions permit the plating of plastic articles without danger of heat distortion.

Claims 1 and 7 are representative of the bath compositions:

1. An electroless nickel bath for applying a nickel coating to articles, comprising water, nickel sulphate, nickel chloride, reducing agent anions for reducing the nickel ions to a metal, and a stabilizing agent for controlling the operating speed of the reducing agent, the bath having an alkaline pH, and the ratio by weight of nickel ions to reducing agent anions being about 1 to 2.7.

7. The bath of claim 1 including for each gallon of bath about 3/4 gallon of water, about 160 to 640 cc. of ammonium hydroxide, about 1 5/8 to

6 1/2 ounces of nickel sulphate, about 4 to 16 ounces of nickel chloride, about 9 5/8 to 38 1/2 ounces of sodium citrate, about 6 3/4 to 27 ounces of ammonium chloride, and about 4 to 24 ounces of sodium hypophosphite.

Sodium hypophosphite acts as the reducing agent and the combination of sodium citrate and ammonium chloride as a stabilizing agent.

The method of coating articles employing this bath is also claimed, as illustrated by claim 12:

12. A method of applying nickel coating to articles comprising treating the articles with a bath of water, nickel sulphate, nickel chloride, a reducing agent for reducing the nickel ions to a metal, and a stabilizing agent for controlling the operating speed of the reducing agent.

A third facet of the invention is found in those claims drawn to a replenish solution for restoring the bath to original constituent levels.

#### The Rejection

Brenner et al. (Brenner) disclose alkaline electroless baths for plating *metallic* surfaces with nickel. The bath constituents include nickel salts such as nickel chloride and nickel sulfate to provide nickel ions, sodium hypophosphite to reduce the nickel ions to metal, ammonium hydroxide to maintain alkalinity, and a combination of sodium citrate and ammonium chloride to hold the nickel salts in solution. In the exemplary bath compositions the nickel salts and sodium hypophosphite are employed in ratios ranging from 10:1 to 3:10, 3:1 being preferred. According to the undisputed calculations supplied by the solicitor, these values represent a range of hypophosphite anion to nickel ion of 0.83:1 to 8.3:1. In the Brenner baths a relatively low concentration of hypophosphite ion (0.07 to 7.5 parts by weight/100 total parts) is employed in contradistinction to the prior art use of high concentrations. The baths are preferably maintained at about 90 degrees to 100 degreesC, although the broad range of 20 degrees to 100 degreesC is said to be operational.

It was the examiner's position that because Brenner disclosed baths containing the same ingredients "within ranges which include the values called for by these claims," it would be obvious to select "a specific set of numerical values from these operable variables." The possibility of low bath temperatures even in the Brenner process was emphasized. Appellant's arguments concerning the prior art

problems associated with the plating of plastic articles were "not considered apropos" inasmuch as "none of the claims are directed specifically to plating plastics."

In sustaining this rejection, the board stressed the overlap of the reference ranges and those of appellant. Alleged advantages in stability, rate of deposition, type of substrate, or temperature of use were deemed "patently immaterial \* \* \*" in the absence of a *compositional* distinction in the claims.<sup>1</sup> Appellant's contentions that Brenner was unaware that bath compositions within the claimed ranges would plate plastics at room temperatures were dismissed with the statement that:

\* \* \* Appellant has not shown that there are critical limits within the reference disclosure which assure unobvious results, and that outside these limits such results cannot be obtained.

\*292 The affidavit of Dr. Narcus, an expert in the field, on the longstanding problem of plating plastic and the solution, in his opinion, by appellant's baths, was found to be irrelevant on the basis that the baths and operating conditions had in fact been disclosed by Brenner.

Claim 7 was additionally rejected under 35 U.S.C. 112 (paragraph one, according to the solicitor's brief) as being based on an insufficient disclosure. Claims 17, 18 and 20 were rejected (under 35 U.S.C. 112 according to the board and under paragraph two of 35 U.S.C. 112 according to the solicitor) as being substantial duplicates of one another. In view of our disposition of the 103 issue infra, we need not consider these rejections.

#### Opinion

Looking first to the 103 rejection, we must agree that the Patent Office has established a case of *prima facie* obviousness for the claimed subject matter. Brenner discloses all of appellant's bath constituents and general ranges for the same which encompass the claimed nickel: hypophosphite ratio and at least some of the hypophosphite concentrations. Although the emphasis in Brenner is on "relatively low" concentrations of hypophosphite to avoid various disadvantages of high concentrations, it is taught that in alkaline baths the rate of deposition is proportional to the hypophosphite concentration to a substantial extent. It is also suggested to replenish the supply of hypophosphite during operation. As for the process, Brenner discloses the use of bath temperatures as low as 20 degreesC, although higher rates of deposition

and better deposits are said to be obtained at 90 degrees to 100 degreesC. Moreover, the "articles" being coated in the claimed process cannot be distinguished from the metallic surfaces plated by the Brenner process.

[1] But that is not the end of the matter. There is no justification for simply ignoring appellant's allegations of unexpected results. See In re Freeman, 474 F.2d 1318, 177 USPQ 139 (CCPA 1973). The broad teachings of Brenner cannot preclude the establishment of unobviousness for specific bath compositions not anticipated thereby. Evidence of properties such as improved stability, higher rate of deposition and capacity to satisfactorily plate plastic articles may well provide adequate rebuttal to the *prima facie* case established by the Patent Office.

The solicitor contends there is no objective evidence in the record to support the claims of either increased stability or greater deposition rate for appellant's bath compositions. We agree. We can find no comparisons with any specific Brenner bath compositions which might even tend to establish any distinction for the claimed compositions on these bases. Nor is there any indication that the alleged differences would be other than expected. Under Freeman the establishment of both elements is crucial to any case for unobviousness based on unexpected results.

But the solicitor's position on the capacity of the claimed compositions to plate plastic articles without heat distortion presents a totally different situation. It is acknowledged that Brenner does not disclose deposition on such a substrate. Furthermore, the Brenner articles which were submitted by appellant during prosecution [FN4] are alleged to provide concrete evidence that the Brenner baths were admittedly not capable of plating plastic satisfactorily. Hence there is a potential difference over the prior art.

[2] The argument that both the bath and method claims cover the coating of metal and are therefore too broad in the sense of 35 U.S.C. 103 cannot be accepted in toto. We agree that appellant's method claims, all of which are broadly drawn to "applying a nickel coating to *articles*" (emphasis added), are not rendered unobvious by a showing that plastic substrates may also be coated. Hence the method claims still read on obvious subject matter. In re Muchmore, 58 CCPA 719, 433 F.2d 824, 167 USPQ 681 (1970). The 103 rejection of method claims 12, 13 and 32-35 must be affirmed.

The same does not hold true, however, for the composition claims. All properties must be considered in determining the obviousness of a composition. In re Murch, 59 CCPA 1257, 464 F.2d 1051, 175 USPQ 89 (1972); In re Freeman, supra.

Turning to the Brenner articles previously mentioned, we find that in November 1947 Brenner stated, in discussing potential surfaces for deposition using his new baths:

Plastic surfaces are noncatalytic, and none of the above procedures will initiate the nickel deposition. In an endeavor to plate plastics, several types were tried in the hot nickel solution. Even when precleaned with organic solvents and acids, the plastics remained noncatalytic. No deposition occurred on the surface when immersed in highly concentrated solutions. When a plastic was silvered prior to immersing in the nickel solution, satisfactory deposition failed to occur. This failure was due primarily to \*293 the silver flaking from the plastic in the hot solution. Other methods of applying a metal film to the plastic might be more successful.

In the later article in November 1954 he noted:

Subsequent to the publication of our papers in 1947, several laboratories found that nickel could be deposited on glass and plastics by the electroless process.

All of this leads us to the conclusion that the specific Brenner bath compositions were not capable of plating plastic. The capacity of appellant's baths to do so satisfactorily is an additional property.

Nor can evidence relevant to the unexpected nature of this newly discovered property be ignored. The Brenner article of November 1954 makes it clear that even the techniques developed by others were far from satisfactory for plastic substrates. The Narcus affidavit attesting to the long felt need for baths of this type must also be given weight. The only remaining qualification is that the unexpected properties actually established be commensurate in scope with the claimed compositions.

Here the specification provides the evidence of plating plastic articles with appellant's bath compositions. But in the only examples which actually demonstrate such plating the bath

compositions are restricted not only to a nickel ion: hypophosphite ratio of 1:2.7 but also to a specific ratio of each of the other components to one another. These limitations have also been stressed by appellant in distinguishing over Brenner. Accordingly, we consider only those claims fully defining such limits of the bath compositions to be commensurate in scope with the demonstrated unexpected properties. Claims 6, 10, 11, 22, 24-28 and 30 satisfy this requirement. The 103 rejection is reversed as to these claims.

Remaining composition claims 1-5, 7, 8, 9, 16-21, 23, 29 and 30 do not recite the essential limitations. Hence the rejection of these claims must be affirmed.

In summary, the 103 rejection is *affirmed* as to claims 1-5, 7, 8, 9, 12, 13, 16-21, 23, 29 and 31-35 and *reversed* as to claims 6, 10, 11, 22, 24-28 and 30. The appeal is *dismissed* as to claims 14, 15 and 36-39.

FN1 A continuation-in-part of application serial No. 504,192, filed October 23, 1965.

FN2 While the examiner omitted claims 20 and 21 from the rejection in his Answer, the board included these claims in the rejection, and appellant, although listing this action as a reason of appeal, has not argued the matter in his brief. Accordingly, we will treat the rejection in the same manner as the board.

FN3 U. S. 2,532,283, issued December 5, 1950.

FN4 Brenner et al., "Nickel Plating on Steel by Chemical Reduction," Journal of Research of the National Bureau of Standards, Vol. 37, July 1946. Brenner et al., "Deposition of Nickel and Cobalt by Chemical Reduction," Journal of Research of the National Bureau of Standards, Vol. 39, November 1947. Brenner, "Electroless Plating Comes of Age," Metal Finishing, November and December 1954.

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general terms which would have sufficed the purpose of preserving his right to pursue them." *Ibid.*

In *United States Rubber Co., supra*, the court held a release which excepted "unknown claims" to bar claims based on facts available to but unappreciated by the maker of the release, saying (160 F.Supp. at 495-96, 142 Ct.Cl. at 46):

\* \* \* if facts were available but not properly assimilated by plaintiff at the time of the termination agreement, plaintiff's failure to comprehend their significance in terms of recoverable expense does not of itself except them from the force of the release. The test is not the state of plaintiff's knowledge, but the availability of information which, properly digested, could reasonably be expected to acquaint plaintiff with the existence of a reimbursable cost.

That all the costs in the instant case not yet incurred at the time the release was given is in the circumstances presented no excuse for the plaintiff's failure to seek to reserve the present claims from the release. Most prominent among the circumstances is that with knowledge of the facts constituting the present claims, plaintiff nevertheless expressed full agreement to giving the Government a slate clean of all claims, with an exception not including the claims presently made.

All the challenges to the Board's decision are without merit and the complaint must be dismissed.



#### **Application of Verne R. RINEHART.**

**Patent Appeal No. 75-608.**

United States Court of Customs  
and Patent Appeals.

March 11, 1976.

Applicant appealed from a decision of the Patent and Trademark Office Board of Appeals, Serial No. 130,743, which affirmed an examiner's rejection of claims for a process for preparing resin on a commercial scale. The Court of Customs and Patent Appeals, Markey, C. J., held that the claims of the patent application for a process for preparing resin on a commercial scale were not obvious.

Reversed.

#### **1. Patents $\Leftrightarrow$ 18, 32**

Prima facie case of obviousness is established when teaching from prior art itself would appear to have suggested the claimed subject matter to person of ordinary skill in art, and once such case is established, it is incumbent upon applicant to go forward with objective evidence of unobviousness. 35 U.S.C.A. § 103.

#### **2. Patents $\Leftrightarrow$ 18**

Prima facie obviousness is legal conclusion, not a fact, and facts established by rebuttal evidence presented by patent applicant must be evaluated along with facts on which earlier conclusion of obviousness was reached, not against conclusion itself. 35 U.S.C.A. § 103.

#### **3. Patents $\Leftrightarrow$ 18**

Claims of patent application for process for preparing resin on commercial scale were not obvious. 35 U.S.C.A. § 103.

#### **4. Patents $\Leftrightarrow$ 18**

Inherency and obviousness are entirely different concepts. 35 U.S.C.A. § 103.

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Paul H. Heller, New York City, attorney of record, for appellant. Hugh A. Chapin, Kenyon & Kenyon Reilly Carr & Chapin,

Cite as 531 F.2d 1048 (1976)

New York City, Ford W. Brunner, James M. Wallace, Jr., Akron, Ohio, Malvin R. Mandelbaum, New York City, of counsel.

Joseph F. Nakamura, Washington, D. C., for the Commissioner of Patents. Jack E. Armore, Washington, D. C., of counsel.

Before MARKEY, Chief Judge, and RICH, BALDWIN, LANE and MILLER, Judges.

MARKEY, Chief Judge.

This is an appeal from the decision of the Patent and Trademark Office Board of Appeals (board) affirming the examiner's final rejection of claims 1 through 9, which are all the claims in appellant's (Rinehart's) application serial No. 130,743, filed April 2, 1971<sup>1</sup> entitled "Process for Preparing Resin." We reverse.

#### *The Invention*

Commercial scale quantities of polymeric ethylene terephthalate (PET) are produced in either a batch or continuous process by heating a dicarboxylic acid with glycol in the presence of a preformed low molecular weight polyester solvent<sup>2</sup> under superatmospheric pressure and utilizing a low ratio of glycol to acid. The product may be conventionally condensation polymerized in the presence of a catalyst.

The claims have been treated together by Rinehart and the solicitor and will be so treated here. Claims 1 and 4 are illustrative:

1. The method for the commercial scale production of polyesters which comprises adding commercial scale quantities of ethylene glycol and a free aromatic dicarboxylic acid in the molar ratio of glycol to acid of from 1.7:1 to 1.05:1 to a
1. The present application is a continuation-in-part of application serial No. 667,854 (parent), filed September 14, 1967, which in turn is a continuation-in-part of application serial No. 254,754, filed January 29, 1963, both of which are now abandoned. Prior to the present appeal, the rejection of parent application was appealed to the U.S. District Court for the District of Columbia. *Goodyear Tire & Rubber Co. v. Schuyler, Com'r.*, Civil No. 666-71

solvent consisting of a preformed low molecular weight linear condensation polyester of a glycol and a dicarboxylic acid, said polyester having an average degree of polymerization of from 1.4 to 10, heating and reacting the mixture at a temperature above the melting temperature of the low molecular weight linear polyester at a pressure of from about 20 to about 1000 pounds per square inch gauge pressure until a linear condensation polyester resin of said glycol and acid having an average degree of polymerization of from 1.4 to 10 is formed.

4. The method for the commercial scale production of polyesters which comprises continuously adding commercial scale quantities of ethylene glycol and terephthalic acid in the ratio of from 1.7:1 to 1.05:1 of ethylene glycol to terephthalic acid to a solvent consisting of low molecular weight ethylene glycol-terephthalate polyester having an average degree of polymerization of from 1.4 to 10 while heating and reacting the mixture at a temperature above the melting temperature of the low molecular weight ethylene glycol-terephthalate polyester at a pressure range of from about 20 to about 1000 pounds per square inch gauge pressure, continuously venting the water vapor formed in the reaction at such a rate that the pressure in the system is maintained constant within said pressure range and continuously withdrawing an amount of low molecular weight ethylene glycol-terephthalate polyester about equal to the amount of ethylene glycol and terephthalic acid added.

#### *Board*

The board affirmed the rejection of claims 1 through 9 under 35 U.S.C. § 103 as

(D.D.C., Feb. 25, 1975). Upon stipulation, that action was dismissed with prejudice, after the express abandonment of the parent application, but without prejudice to the allowance of materially different claims, or of the same or similar claims on a record supporting them, such as the record now before us.

2. The solvent may include stabilizer, catalyst, and ether inhibitors.

obvious on Pengilly<sup>3</sup> and Munro et al. (Munro)<sup>4</sup> "considered together."<sup>5</sup> Both Pengilly and Munro form PET by heating, in either a batch or continuous process, a dicarboxylic acid with glycol, utilizing low ratios of glycol to acid (for example, 1.05:1.0 to 1.3:1.0 for Pengilly), and then polymerizing the low molecular weight ester formed therefrom in the presence of a catalyst. The processes differ in that the initial step of the Pengilly process is conducted at atmospheric pressure utilizing a preformed polyester solvent, whereas Munro operates at a higher pressure absent the solvent.

The appealed claims differ substantively from those of the parent application only in reciting "commercial scale production" utilizing "commercial scale quantities." Because the claims in the parent application had been rejected under 35 U.S.C. § 103 on the same prior art and logic, the board merely adopted the previous board opinion, which held that the references established a case of "prima facie obviousness." The earlier board, agreeing with the examiner that Pengilly and Munro considered together rendered the claimed subject matter prima

facie obvious because each suggested consonant advantages, stated:

For example, Pengilly suggests that by using a polyester solvent shorter heating times and less glycol is required, and Munro et al suggests that by using higher pressures a shorter reaction time is required. One of ordinary skill in the polymer art would therefore expect that if higher pressures were used in other art processes (i. e., Pengilly) shorter reaction times would be necessary.<sup>6</sup>

The board considered the rebuttal evidence, a single affidavit by the inventor, Rinehart, to be insufficient. The primary apparent purpose of that evidence was to show the commercial inoperability of Pengilly and Munro, taken individually, compared to Rinehart's commercially used method. Rinehart's extensive affidavit included, however, substantial analysis of the entire field of polyester production and of what, in his view, Pengilly and Munro would actually teach those skilled in the art. The experimental pilot plant evidence is summarized below for a low charge molar ratio of glycol to acid (1.1:1.0):

#### Esterification Reaction

	1 Munro	2 Rinehart	3 Pengilly	4 Munro
Pressure (psig)	40	40	0 (Atmos.)	40
Temperature (° C.)	250-261	248-252	*	260-262
Reactant Batch				
Size (pounds)	122.1	122.1	122.1	268.6
[Solvent]/Batch	No [Solvent]	1.2/1.0	1.2/1.0	No [Solvent]
Average Time (Min.)	330	150	657	483

\*The temperature was increased at a rate of 3° C./30 minutes from about 220° C. to 245° C.

3. U.S. Patent No. 3,427,287 issued February 11, 1969.

tion, subsequent to the board's decision, moots the issue.

4. U.S. Patent No. 3,050,533 issued August 21, 1962.

6. The earlier board also speculated that Munro's continuous process may "actually involve the use of preformed ester as the reaction solvent if the reaction takes place throughout the reactor and if, during the initial part of the process, the product is not withdrawn as rapidly as it is formed."

5. The board also affirmed a double patenting rejection of those claims under 35 U.S.C. § 101 based upon the copending parent application. Express abandonment of the parent applica-

Properties of High Polymer

% Ether	2.99	1.68	1.51	3.08
Melting Point	244.9	252.2	252.8	244.1
Gardner Rd	27.1	24.9	27.0	25.4
Gardner b +	14.0	8.3	13.6	17.8

Rinehart alleged commercial success, based on the 1970 conversion by Goodyear Tire and Rubber Company (the assignee of Rinehart) from the ester interchange method, used since 1959, to Rinehart's direct esterification method.

The affidavit states:

Both the Pengilly, and Munro and Maclean, procedures based on my experience and as evidenced from their patents are operable on a small scale. However, neither of their patents points to any recognition of the problems which arise from scaling up to a commercial process. It is implicit in their patents that the described procedures are satisfactory for commercial operation; but I have found that their techniques are not satisfactory on a commercial scale at about equimolar proportions. The advantages claimed by Munro and Maclean for their process are a short reaction time, improved color, higher softening point and a minimum ether content. However, I have found that as the Munro and Maclean process is scaled up beyond laboratory equipment the reaction becomes inconveniently long, the color deteriorates, the melting point is lowered and the ether content increases. The process of Pengilly was similarly operable on a small scale and not suitable for scale-up to a commercial process.

The board concluded that the affidavit evidence did not rebut its finding of prima facie obviousness because, in its view, the prior art clearly suggested higher pressure, together with an expected attendant advantage of increased reaction rate, as a solution to the commercial difficulties allegedly encountered by Rinehart. Moreover, the recitation to which the affidavit is directed, "commercial scale production" utilizing "commercial scale quantities," was viewed as "inherently" obvious. The board did not consider the utilization of the claimed meth-

od by Rinehart's assignee to be evidence of commercial success sufficient to establish unobviousness.

Issue

Whether, in the light of all the evidence, the claimed method would have been obvious at the time the invention was made.

OPINION

Pengilly and Munro individually teach methods for the production of PET which differ, in different respects, from that claimed by Rinehart. A determination under 35 U.S.C. § 103, however, requires consideration of the entirety of the disclosure made by the two references to those skilled in the art.

[1] A prima facie case of obviousness is established when the teachings from the prior art itself would appear to have suggested the claimed subject matter to a person of ordinary skill in the art. Once such a case is established, it is incumbent upon appellant to go forward with objective evidence of unobviousness. *In re Fielder*, 471 F.2d 640 (CCPA 1973).

*Prima Facie Obviousness*

On the appeal involving Rinehart's parent application, the board was limited to the sterile evaluation of the claims and the prior art necessitated by availability of only the application and the cited references. Based on that evaluation, that board stated:

We agree with the examiner that, in view of Munro et al., it would be obvious to operate the process of Pengilly at superatmospheric pressure. Looking at it from another point of view, it would be obvious in view of Pengilly to employ preformed ester as a solvent in the reaction of Munro et al.

On the appeal of the present application, the board stated:

With regard to the rejection under Section 103, we find ourselves in substantial agreement with the position of the examiner as set forth in his answer. The claims on appeal are in essence the same as those in Serial No. 667,854, which is now before the District Court for the District of Columbia (Civil Action 666-71), the basic difference being the involved claims recite and are limited to "commercial scale production" utilizing "commercial scale quantities." The claimed invention is otherwise identical insofar as the material limitations defined are concerned. The claims in parent case Serial No. 667,854 were rejected under Section 103 over the same art applied herein and essentially for the same reasons. Insofar as the question of whether or not the combination of the teachings of Pengilly and Munro et al would render the claimed process *prima facie* obvious, the same arguments were presented by appellant and the examiner in both the prior case and herein. Based on these arguments, the Board of Appeals agreed with the position of the examiner and affirmed the rejection. Appellant has set forth no good and sufficient reason why we should reconsider the prior Board decision or reach any other conclusion based on the arguments alone; we therefore adhere to that position and adopt it as our own.

The only remaining question for this Board to consider with regard to the Section 103 rejection is whether or not the affidavit filed under the provisions of Rule 132 is sufficient to rebut the *prima facie* case: in our opinion, it is not.

The board erred in adopting the earlier opinion. The basis for evaluation and for decision had changed. The present board had before it not only the application and the prior art but all of the unrebutted facts established in Rinehart's affidavit. At that stage no question of *prima facie* obviousness remains. The appealed claims must be reconsidered in the light of all the evidence, and the resultant finding, that the claimed

invention would or would not have been obvious, is to be made in such light.

[2] The concept of rebuttable *prima facie* obviousness is well established. Cf. *In re Freeman*, 474 F.2d 1318 (CCPA 1973); *In re Klosak*, 455 F.2d 1077, 59 CCPA 862 (1972); *In re D'Ancicco*, 439 F.2d 1244, 58 CCPA 1057 (1971). It is not, however, a segmented concept. When *prima facie* obviousness is established and evidence is submitted in rebuttal, the decision-maker must start over. Though the burden of going forward to rebut the *prima facie* case remains with the applicant, the question of whether that burden has been successfully carried requires that the entire path to decision be retraced. An earlier decision should not, as it was here, be considered as set in concrete, and applicant's rebuttal evidence then be evaluated only on its knockdown ability. Analytical fixation on an earlier decision can tend to provide that decision with an undeservedly broadened umbrella effect. *Prima facie* obviousness is a legal conclusion, not a fact. Facts established by rebuttal evidence must be evaluated along with the facts on which the earlier conclusion was reached, not against the conclusion itself. Though the tribunal must begin anew, a final finding of obviousness may of course be reached, but such finding will rest upon evaluation of all facts in evidence, uninfluenced by any earlier conclusion reached by an earlier board upon a different record.

The board's analytical process appears to have resulted, at least in part, from Rinehart's erroneous argument that the mere inclusion of "commercial scale production" and "commercial scale quantities" served to patently distinguish the appealed claims over those in the parent application. In response, the board engaged in comparison of the two sets of claims and emphasized their essential identity. Whether engendered by Rinehart's arguments, the concentration on the "inherent obviousness" of scaling up led Rinehart and the solicitor into error.

Rinehart erred in contending that the mere insertion into the claims of "commer-

cial scale," without more, would constitute a distinguishing limitation. Though inclusion of the phrase in the claims does no harm, it is clear that mere scaling up of a prior art process capable of being scaled up, if such were the case, would not establish patentability in a claim to an old process so scaled. Moreover, absent evidence to the contrary, nothing in Pengilly or Munro indicates that their processes are not effective on a commercial scale, and Rinehart concedes that commercial operation is implicit in the reference patents.

Rinehart argues here that merely because the appealed claims include a "crucial limitation" to commercial quantities, they were "different claims" and that the board could not therefore have applied the earlier decision to them. We cannot agree. Absent the evidence in Rinehart's affidavit, use of commercial quantities in the processes of the references would have been obvious. If all Rinehart had done was to add the broad "commercial scale" phrases, the board's treatment would have been correct. It could not have found that the mere use of commercial quantities established unobviousness of the invention as a whole. But Rinehart did more. He submitted substantial evidence touching the basic question of whether his claimed process would have been obvious.

The board erred, as above indicated, in comparing the appealed claims to the earlier claims as though it had been established that the latter did in fact set forth an old or obvious process. In such comparison, the board proceeded as though the earlier claims were a kind of prior art to Rinehart and as though the earlier decision on those claims was a kind of res judicata. The differences between the two sets of claims were simply not at issue in this case. The sole question is whether Rinehart's claimed process would have been obvious in view of all the evidence.

#### *The Evidence*

The opinion of the board on the appeal involving the parent application included the following:

Appellant alleges the existence of numerous difficulties with the processes of Pengilly and Munro et al. which, he claims, are overcome by combining the features of both processes. However, appellant's allegations are not supported by any evidence.

[3] The evidence now of record, in our view, does support Rinehart's allegations. The assertion that the processes of Pengilly and Munro cannot satisfactorily be scaled up is neither challenged nor rebutted. Though mere reference to "commercial scale quantities" in the claims and affidavit does not itself establish patentability, it does establish the environment of the invention. It outlines the problem solved and gives dimension to Rinehart's contribution. The claims must therefore be considered, and the references must be evaluated, in the light of an effort to achieve commercially effective production. As will appear hereinbelow, the affidavit evidence also spotlights portions of the prior art disclosures indicating unobviousness of the claimed process.

It is true that Pengilly and Munro both disclose processes for polyester production by direct esterification. Rinehart's affidavit admits that he began with an effort to employ the process of Pengilly on a commercial scale and that the only essential difference between the claimed process and that of Pengilly is the employment of superatmospheric pressure.

The board adopted the earlier opinion, which considered the claimed process as either that of Pengilly with the substitution of the superatmospheric pressure disclosed by Munro or that of Munro with the use of a preformed polyester as disclosed by Pengilly. But that view of the claimed process does not end the inquiry. The question remains whether it would have been obvious, in scaling up Pengilly's process, to have employed Munro's higher pressures or in scaling up that of Munro to have employed Pengilly's preformed polyester.

[4] The tribunals below did not meet the requirement of establishing some pre-

dictability of success in any attempt to combine elements of the reference processes in a commercial scale operation. As in *In re Naylor*, 369 F.2d 765, 54 CCPA 902 (1966), we find nothing in the record which would lead one of ordinary skill to anticipate successful production on a commercial scale from a combination of such elements, without increase in glycol-acid ratio. The record in fact reflects the contrary. The view that success would have been "inherent" cannot, in this case, substitute for a showing of reasonable expectation of success. Inherency and obviousness are entirely different concepts. *In re Spormann*, 363 F.2d 444, 53 CCPA 1375 (1966); *In re Adams*, 356 F.2d 998, 53 CCPA 996 (1966).

The board cited the indication in both Pengilly and Munro that their processes led to rapid reaction time and concluded that improved reaction time would be expected if elements of those processes were combined. The evidence of record establishes, however, that reaction times of both prior processes lengthen as the processes are scaled up.

The board held the view that Munro's teaching of higher pressures to increase reaction rate would have provided an obvious solution to the problem Rinehart encountered in scaling up the process of Pengilly. But Rinehart's problem was not the need for increased reaction rate. It was, as the evidence established, the existence of lumps of frozen polymer. That problem is nowhere alluded to in either Pengilly or Munro, and of course no suggestion of a solution appears in either reference.

Moreover, Pengilly suggested that superatmospheric pressure was productive of certain disadvantages, particularly the need for use of a "large excess" of glycol. The use of superatmospheric pressure in a direct esterification process was referred to in other prior patents of record. With the exception of Munro, however, each such reference cited disadvantages of its use or an inability to find it workable. Munro's disclosure of superatmospheric pressure is rendered an abstraction with respect to appellant's problem by Munro's indication of

the same excess glycol requirement when a large scale operation is contemplated. Munro employs a large excess of glycol (a ratio of glycol to acid of 3:1) in his example 5, the only example devoted to larger scale production. Rinehart's large scale production process is limited to a substantially equimolar ratio of glycol to acid. In view of all of the evidence, we cannot agree that Munro would suggest to one skilled in the art the use of superatmospheric pressure to solve the problem of scaling up the process of Pengilly.

Similarly, we find no suggestion in Pengilly or in Munro that Pengilly's preformed ester be employed in Munro's process to overcome the problems encountered in scaling up the process of Munro. Munro, as co-inventor with Lewis in earlier British Patent No. 776,282, was familiar with the use of a preformed polyester in direct esterification, yet neither Munro nor his co-inventor Maclean suggested its use with superatmospheric pressure in the cited reference. We find that the Munro patent contains its own solution to large scale operation, i. e., the use of excess glycol referred to above. That solution is not employed by appellant.

Absence of any suggestion in either Pengilly or Munro that features of the process of one should be combined with features of the other to achieve the commercial scale production of which neither is capable requires a holding that the rejection herein was improper. *In re Avery*, 518 F.2d 1228 (CCPA 1975). In view of that holding, it is unnecessary to consider Rinehart's allegations of commercial success and satisfaction of long-felt need.

The decision of the board is reversed.  
REVERSED.



27 C.C.P.A. (Patents)

**In re KAPLAN.****Patent Appeal No. 4286.**

Court of Customs and Patent Appeals.

April 8, 1940.

**1. Patents 8, 45**

A patent may not be granted for a result, but a claimed result may be looked to in considering the matter of novelty in a described step.

**2. Patents 113(7)**

Where the questions raised by application for a patent are technical in character, the Court of Customs and Patent Appeals hesitates to disagree with concurring decisions of the tribunals of the Patent Office, but where it is clear that a step, not disclosed by prior art, is involved, the court must fully consider it and if in the court's opinion such step lends patentability to the claim or claims, must say so.

**3. Patents 66(1)**

Process claims 3, 4, 5, 7, 8, 9 and 12, in an application for patent entitled "Complete Conversion of Petroleum Oils", were improperly denied patentability over the prior art.

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Appeal from the Board of Patent Appeals, Serial No. 37,809.

Proceeding in the matter of the application of William Kaplan for a patent entitled "Complete Conversion of Petroleum Oils." From a decision of the Board of Appeals of the United States Patent Office affirming that of the examiner denying patentability, the applicant appeals.

Reversed.

Edmund G. Borden, of New York City, for appellant.

Howard S. Miller, of Washington, D. C., for Commissioner of Patents.

Before GARRETT, Presiding Judge, and BLAND, HATFIELD, LENROOT, and JACKSON, Associate Judges.

GARRETT, Presiding Judge.

This is an appeal from the decision of the Board of Appeals of the United States Patent Office affirming that of the examiner denying patentability, in view of prior art cited, of seven claims, numbered, respective-

ly, 3, 4, 5, 7, 8, 9, and 12, in an application for patent entitled "Complete Conversion of Petroleum Oils."

Claim 7 is broadest in scope. It reads: "7. The process of cracking residue oils in the vapor phase, which comprises injecting the residue oil into a high temperature stream of hydrocarbon vapor passing through a long tube of restricted cross-section mounted in a heating zone, intimately spraying the residue into the stream in such a ratio to the vapor stream that the residue is instantly vaporized and the constituents thereof carried in intimate dispersion in the vapor stream, controlling the heating of said stream in said zone to maintain the same above the dew-point of the mixture, and continuing the heating of the vapor mixture for a sufficient period of time to convert a substantial proportion of the oil residue into constituents boiling in the gasoline range."

Claim 3 is illustrative of the more specific claims. It reads: "3. The process of completely converting a petroleum oil stock of higher boiling point than gasoline to constituents boiling within the gasoline range, carbon and gas, which comprises subjecting such stock to treatment in a cracking system and removing therefrom substantially only liquid constituents boiling within the gasoline range, carbon and gas, said stock being passed under a super-atmospheric pressure in a confined stream of restricted cross-section through a first heating zone in which the stock is heated to a cracking temperature in excess of 950 °F. and then in a second heating zone in which said stock is heated in the vapor phase for a substantial period of time, heating the vapor stream in said second heating zone to progressively convert the constituents of said stream into a total condensable product of progressively decreasing specific gravity to a minimum and then of progressively increasing specific gravity from said minimum as the stream of vapors advance through said second heating zone, discharging the oil constituents from said second heating zone separating suspended carbon therefrom and fractionating the vapor products to separate out constituents of higher boiling point than those in the gasoline range, returning at least a portion of said higher boiling point constituents to said second heating zone and spraying the same into the vapor stream passing therethrough at a point in said stream directly following its attainment of said minimum

specific gravity, and heating the vapor stream containing the sprayed constituents to substantially maintain the temperature of the stream at conversion conditions for a time sufficient to convert a substantial proportion of said sprayed constituents to products boiling within the gasoline range."

During the prosecution of the case quite a number of references were cited, but as to the appealed claims only three were relied upon, to wit:

Behimer, 1,923,526, Aug. 22, 1933;  
Behimer, 1,979,437, Nov. 6, 1934;  
Donnelly, 2,052,340, Aug. 25, 1936.

Of these the patent to Donnelly was primarily relied upon by the examiner and it was the only one to which the board made any reference.

Each of the appealed claims, all of them being process claims, contains a step defined in claim 7, supra, by the clause "intimately spraying the residue into the stream in such a ratio to the vapor stream that the residue is instantly vaporized and the constituents thereof carried in intimate dispersion in the vapor stream."

In claim 4 the residuum stock is described as "being sprayed into said stream at a point therein at which said vapor stream has commenced to decrease in gasoline boiling point range constituents from said maximum content." Various of the claims define "maintaining the vapor stream containing said sprayed residual stock at a temperature of at least about 950 °F." for a certain period of time.

Appellant states in his brief as follows:

"The amount of residue introduced and the point of introduction of the residue are carefully controlled so that all of the oil passing through the heating coil, at the point of introduction of residue, is in the vapor phase. The temperature of the vapor at the point of introduction is sufficiently high, so that when the residue is introduced into the heating coil as a fine spray, it will all be instantly vaporized. Furthermore, this oil is held above the dew point temperature so that there will not be any liquid oil in the heating coil to produce coke. Appellant has also found that this method of injection may be used advantageously in long-time digestion, aromatic-forming, vapor phase processes for simultaneously cracking oil residuum, and for controlling the exothermic reaction

which inevitably results during the formation of aromatics.

"The important feature of appellant's invention therefore relates to the method of vaporizing a residue to permit vapor phase cracking of the residue by controlling the temperature and pressure conditions in the coil so that no liquid oil will be present in the cracking coil and the temperature of the vapors in the coil will be above the dew point."

From our study of the case we are convinced that the step of spraying the residue into that oil which passes in vapor phase through the heating coil is the only element necessary to be considered here.

It is the contention of appellant that no one of the references specifically defines this step. The contention is correct. Donnelly discloses a complicated apparatus, not necessary to be described in detail, nor is it necessary to describe with particularity the elaborate system shown by appellant.

In its decision the board said:

"It is true that Donnelly does not particularly refer to certain conditions in the oil vapor which is being converted as determining the point at which the heavier oil is to be introduced. He also does not state that the heavier oil is sprayed into the vapor.

"We note, in the sentence beginning on page 10 at line 17 of appellant's specification, that the heavier oil is introduced as a means of controlling the heat of the oil being converted as well as to crack the heavier oil. In Donnelly, in the paragraph commencing on page 4, second column at line 35, there is a discussion of introducing oil to control the reaction of the oil being converted. In the discussion on page 2 of that patent, in the paragraph continuing from page 1, it is disclosed that the temperature at the time that the heavier oil is introduced is between 925 ° and 1125 °F. In the same column at line 43 there is a statement to the effect that heat may be applied if desired. In the next column of this page at line 51 it is indicated in effect that intimate physical contact of vaporous and liquid products occurs. The condition of the oil in coils 33 and 33' is also described on page 4 in the paragraph commencing in the first column at line 48. We have not overlooked the fact that on page 2 at line 16 of the first column there is a reference to preventing complete vaporization of fractions, but we do not consider

that this can be regarded as indicating that the treatment is in liquid phase.

"While Donnelly does not definitely describe spraying the heavier oil into the stream of oil being converted, we believe that, at the temperatures employed, both oils will substantially mingle without forming drops. In any event, in view of what we believe to be the teachings of that patent, we do not consider that it would involve invention to introduce the heavier oil in the form of spray if it were found that a liquid deposit was formed."

There are certain expressions in the statement of the examiner indicating that, in his opinion, the appealed claims differ from the prior art only in the result stated, and in the decision of the board the opinion is expressed "that appellant, as far as the appealed claims are involved, has merely described conditions which are likely to exist in the functioning of that [Donnelly's] apparatus."

[1] Of course, a patent may not be granted for a result, but it is not improper to look to a claimed result in considering the matter of novelty in a described step.

[2] The questions here are technical in character. Where such is the case this court hesitates to disagree with concurring decisions of the tribunals of the Patent Office, but where it is clear that a step, not disclosed by prior art, is involved, it is our duty fully to consider it and if, in our opinion, such step lends patentability to the claim, or claims, to say so.

[3] In the instant case it is apparent that the applicant has taught a definite step which the prior art cited did not teach. Furthermore, he states a result distinctly different from the result obtained in the operation of any of the steps defined in the patents cited as references. The teaching of Donnelly is to the effect that after he introduced residuum there was a liquid condition in the substance in the coil. Appellant teaches that, as the direct result of his spraying step, such condition is eliminated.

It may be, as intimated by the tribunals of the Patent Office, that by reason of the temperatures defined by Donnelly, the practice of his process would produce a result similar to that obtained by appellant, but it seems to us that this is highly speculative because Donnelly does not teach such a result, nor does he define the step of spraying which appellant claims does produce it.

Under such circumstances, we are of opinion that the claims should be allowed.

Since the feature which we have emphasized is involved in all the claims there appears to be no necessity of discussing other limitations contained in them.

The decision of the Board of Appeals is reversed.

Reversed.



27 C.C.P.A. (Patents)

**BELLAMY et al. v. SNAVELY et al.**  
Patent Appeal No. 4312.

Court of Customs and Patent Appeals.  
April 1, 1940.

Patents 106(2)

Interference counts describing invention relating broadly to electrical indicating signals were not supported by disclosure of senior party in respect to controverted limitation, and priority of invention was properly awarded to junior party.

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Appeal from Board of Appeals of the United States Patent Office, Interference No. 75,516.

Interference between J. I. Bellamy and others and C. S. Snavely and others. From a decision of the Board of Appeals of the United States Patent Office reversing the decision of the Examiner of Interferences and awarding priority of invention to the latter, the former appeal.

Affirmed.

Charles M. Candy, of Chicago, Ill., for appellants.

R. H. Wood, of Swissvale, Pa. (Richard Eyre, of New York City, and R. H. Wood, of Swissvale, Pa., of counsel), for appellees.

Before GARRETT, Presiding Judge, and BLAND, HATFIELD, LENROOT, and JACKSON, Associate Judges.

BLAND, Associate Judge.

The appellants have here appealed from the decision of the Board of Appeals of the United States Patent Office, reversing the decision of the Examiner of Inter-

**C**

In re Rinehart

Court of Customs and Patent Appeals

No. 75-608

Decided Mar. 11, 1976  
United States Patents Quarterly Headnotes**PATENTS****[1] Double patenting -- Copending applications (§ 33.5)**

Double patenting rejection that was based on copending parent application and affirmed by Board of Appeals is mooted by parent application's express abandonment after board's decision.

**PATENTS****[2] Patentability -- Anticipation -- Combining references (§ 51.205)**

**Patentability -- Invention -- In general (§ 51.501)**  
Determination under 35 U.S.C. 103 requires consideration of entirety of disclosure made by prior art references to those skilled in art.

**PATENTS****[3] Patentability -- Invention -- In general (§ 51.501)**

Prima facie case of obviousness is established when teachings of prior art appear to suggest claimed subject matter to person of ordinary skill in art; it is incumbent upon applicant to go forward with objective evidence of unobviousness once prima facie case is established.

**PATENTS****[4] Board of Appeals -- In general (§ 19.05)**  
**Patentability -- Invention -- In general (§ 51.501)**  
**Prior adjudication -- New evidence or new issues (§ 56.25)**

It was error to adopt earlier conclusion of prima facie obviousness that was based on parent application and cited references when Board of Appeals had continuation application, prior art, and unrebutted facts established by inventor's affidavit before it, so that no question of prima facie

obviousness remained; obviousness determination must be made in light of all evidence.

**PATENTS****[5] Patentability -- Evidence of -- In general (§ 51.451)**

**Patentability -- Invention -- In general (§ 51.501)**  
**Patentability -- Invention -- Law or fact question (§ 51.507)**

Concept of *prima facie* obviousness is not segmented concept; decision-maker must start over when rebuttal evidence is submitted after *prima facie* obviousness is established; question of whether applicant's burden of going forward to rebut *prima facie* case has been successfully carried requires that entire path to decision be retraced; earlier decision should not be considered as set in concrete and applicant's rebuttal evidence evaluated only on its knockdown ability; *prima facie* obviousness is legal conclusion, not fact; facts established by rebuttal evidence must be evaluated along with facts on which earlier conclusion was reached, not against conclusion itself.

**PATENTS****[6] Applications for patent -- Continuing (§ 15.3)**  
**Patentability -- Change -- Proportions (§ 51.259)**

Mere inclusion of "commercial scale production" and "commercial scale quantities" in claims of continuation application does not patentably distinguish them over claims of parent application.

**PATENTS****[7] Patentability -- Change -- Proportions (§ 51.259)****Patentability -- Invention -- In general (§ 51.501)**

Mere scaling up of prior art process capable of being scaled up would not establish patentability in claim to old process so scaled; mere use of commercial quantities cannot establish unobviousness of invention as whole.

**PATENTS****[8] Affidavits -- Distinguishing from references (§ 12.7)****Patentability -- Change -- Proportions (§ 51.259)**

Reference to "commercial scale quantities" in

claims and inventor's affidavit establishes invention's environment, outlining problem solved and giving dimension to inventor's contribution, but does not establish patentability.

## PATENTS

[9] Patentability -- Anticipation -- Combining references (§ 51.205)

Patentability -- Change -- Proportions (§ 51.259)

Patentability -- Invention -- In general (§ 51.501)

Some predictability of success is required in any attempt to combine elements of reference processes in commercial scale operation; view that success would have been "inherent" cannot substitute for showing of reasonable expectation of success; inherency and obviousness are entirely different concepts.

## PATENTS

[10] Court of Customs and Patent Appeals -- Issues determined -- Ex parte patent cases (§ 28.203)

Patentability -- Anticipation -- Combining references (§ 51.205)

Patentability -- Change -- Proportions (§ 51.259)

Patentability -- Invention -- In general (§ 51.501)

Absence of suggestion in prior art patents that features of one should be combined with those of other to achieve commercial scale production of which neither is capable requires conclusion that obviousness rejection of claims directed to commercial scale production was improper, making it unnecessary for court to consider allegations of commercial success and satisfaction of long-felt need.

## PATENTS

Particular patents -- Resin

Rinehart, Process for Preparing Resin, rejection of claims 1-9 reversed.

\*144 Appeal from Patent and Trademark Office Board of Appeals.

Application for patent of Verne R. Rinehart, Serial No. 130,743, filed Apr. 2, 1971, continuation in part of application Serial No. 667,854, filed Sept. 14, 1967, continuation in part of application Serial No. 254,754, filed Jan. 29, 1963. From decision rejecting claims 1-9, applicant appeals. Reversed.

Paul H. Heller, New York, N.Y. (Hugh A. Chapin,

Kenyon & Kenyon Reilly Carr & Chapin, and Malvin R. Mandelbaum, all of New York, N.Y., and Ford W. Brunner and James M. Wallace, Jr., both of Akron, Ohio, of counsel) for appellant.

Joseph F. Nakamura (Jack E. Armore, of counsel) for Commissioner of Patents and Trademarks.

Before Markey, Chief Judge, and Rich, Baldwin, Lane, and Miller, Associate Judges.

Markey, Chief Judge.

This is an appeal from the decision of the Patent and Trademark Office Board of Appeals (board) affirming the examiner's final rejection of claims 1 through 9, which are all the claims in appellant's (Rinehart's) application serial No. 130,743, filed April 2, 1971 [FN1] entitled "Process for Preparing Resin." We reverse.

### *The Invention*

Commercial scale quantities of polymeric ethylene terephthalate (PET) are produced in either a batch or continuous process by heating a dicarboxylic acid with glycol in the presence of a preformed low molecular weight polyester solvent [FN2] under superatmospheric pressure and utilizing a low ratio of glycol to acid. The product may be conventionally condensation polymerized in the presence of a catalyst.

The claims have been treated together by Rinehart and the solicitor and will be so treated here. Claims 1 and 4 are illustrative:

1. The method for the commercial scale production of polyesters which comprises \*145 adding commercial scale quantities of ethylene glycol and a free aromatic dicarboxylic acid in the molar ratio of glycol to acid of from 1.7:1 to 1.05:1 to a solvent consisting of a preformed low molecular weight linear condensation polyester of a glycol and a dicarboxylic acid, said polyester having an average degree of polymerization of from 1.4 to 10, heating and reacting the mixture at a temperature above the melting temperature of the low molecular weight linear polyester at a pressure of from about 20 to about 1000 pounds per square inch gauge pressure until a linear condensation polyester resin of said glycol and acid having an average degree of polymerization of from 1.4 to 10 is formed.

4. The method for the commercial scale production of polyesters which comprises continuously adding commercial scale quantities of ethylene glycol and terephthalic acid in the ratio of from 1.7:1 to 1.05:1 of ethylene glycol to terephthalic acid to a solvent consisting of low molecular weight ethylene glycol-terephthalate polyester having an average degree of polymerization of from 1.4 to 10 while heating and reacting the mixture at a temperature above the melting temperature of the low molecular weight ethylene glycol-terephthalate polyester at a pressure range of from about 20 to about 1000 pounds per square inch gauge pressure, continuously venting the water vapor formed in the reaction at such a rate that the pressure in the system is maintained constant within said pressure range and continuously withdrawing an amount of low molecular weight ethylene glycolterephthalate polyester about equal to the amount of ethylene glycol and terephthalic acid added.

*Board*

[1] The board affirmed the rejection of claims 1 through 9 under 35 USC 103 as obvious on Pengilly [FN3] and Munro et al. (Munro) [FN4]"considered together." [FN5] Both Pengilly and Munro form PET by heating, in either a batch or continuous process, a dicarboxylic acid with glycol, utilizing low ratios of glycol to acid (for example, 1.05:1.0 to 1.3:1.0 for Pengilly), and then polymerizing the low molecular weight ester formed therefrom in the presence of a catalyst. The processes differ in that the initial step of the Pengilly process is conducted at atmospheric pressure utilizing a preformed polyester solvent, whereas Munro operates at a higher pressure absent the solvent.

The appealed claims differ substantively from those of the parent application only in reciting "commercial scale production" utilizing "commercial scale quantities." Because the claims in the parent application had been rejected under 35 USC 103 on the same prior art and logic, the board merely adopted the previous board opinion, which held that the references established a case of "prima facie obviousness." The earlier board, agreeing with the examiner that Pengilly and Munro considered together rendered the claimed subject matter prima facie obvious because each suggested consonant advantages, stated:

For example, Pengilly suggests that by using a polyester solvent shorter heating times and less glycol is required, and Munro et al suggests that by using higher pressures a shorter reaction time is required. One of ordinary skill in the polymer art would therefore expect that if higher pressures were used in other art processes (i.e., Pengilly) shorter reaction times would be necessary. [FN6]

The board considered the rebuttal evidence, a single affidavit by the inventor, Rinehart, to be insufficient. The primary apparent purpose of that evidence was to show the commercial inoperability of Pengilly and Munro, taken individually, compared to Rinehart's commercially used method. Rinehart's extensive affidavit included, however, substantial analysis of the entire field of polyester production and of what, in his view, Pengilly and Munro would actually teach those skilled in the art. The experimental pilot plant evidence is summarized below for a low charge molar ratio of glycol to acid (1.1:1.0):

Esterification Reaction

	1	2	3	4
Munro		Rinehart	Pengilly	Munro
Pressure (psig)	40	40	0 (Atmos.)	40
Temperature ( degreesC.)	250-261	248-252	a1	260-262
Reactant Batch Size				
(pounds)	122.1	122.1	122.1	268.6
[Solvent]/Batch	No [Solvent]	1.2/1.0	1.2/1.0	No [Solvent]

Average Time (Min.)	330	150	657	483
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#### Properties of High Polymer

% Ether	2.99	1.68	1.51	3.08
Melting Point	244.9	252.2	252.8	244.1
Gardner Rd	27.1	24.9	27.0	25.4
Gardner b+	14.0	8.3	13.6	17.8

a1 \*146 The temperature was increased at a rate of 3 degrees C/30 minutes from about 220 degreesC to 245 degreesC.

Rinehart alleged commercial success, based on the 1970 conversion by Goodyear Tire and Rubber Company (the assignee of Rinehart) from the ester interchange method, used since 1959, to Rinehart's direct esterification method.

The affidavit states:

Both the Pengilly, and Munro and Maclean, procedures based on my experience and as evidenced from their patents are operable on a small scale. However, neither of their patents points to any recognition of the problems which arise from scaling up to a commercial process. It is implicit in their patents that the described procedures are satisfactory for commercial operation; but I have found that their techniques are not satisfactory on a commercial scale at about equimolar proportions. The advantages claimed by Munro and Maclean for their process are a short reaction time, improved color, higher softening point and a minimum ether content. However, I have found that as the Munro and Maclean process is scaled up beyond laboratory equipment the reaction becomes inconveniently long, the color deteriorates, the melting point is lowered and the ether content increases. The process of Pengilly was similarly operable on a small scale and not suitable for scale-up to a commercial process.

The board concluded that the affidavit evidence did not rebut its finding of prima facie obviousness because, in its view, the prior art clearly suggested higher pressure, together with an expected attendant advantage of increased reaction rate, as a solution to the commercial

difficulties allegedly encountered by Rinehart. Moreover, the recitation to which the affidavit is directed, "commercial scale production" utilizing "commercial scale quantities," was viewed as "inherently" obvious. The board did not consider the utilization of the claimed method by Rinehart's assignee to be evidence of commercial success sufficient to establish unobviousness.

#### Issue

Whether, in the light of all the evidence, the claimed method would have been obvious at the time the invention was made.

#### Opinion

[2] Pengilly and Munro individually teach methods for the production of PET which differ, in different respects, from that claimed by Rinehart. A determination under 35 USC 103, however, requires consideration of the entirety of the disclosure \*147 made by the two references to those skilled in the art.

[3] A *prima facie* case of obviousness is established when the teachings from the prior art itself would appear to have suggested the claimed subject matter to a person of ordinary skill in the art. Once such a case is established, it is incumbent upon appellant to go forward with objective evidence of unobviousness. In re Fielder, 471 F.2d 640, 176 USPQ 300 (CCPA 1973).

#### Prima Facie Obviousness

On the appeal involving Rinehart's parent application, the board was limited to the sterile evaluation of the claims and the prior art necessitated by availability of only the application and the cited references. Based on that evaluation, that board stated:

We agree with the examiner that, in view of Munro et al., it would be obvious to operate the process of

Pengilly at superatmospheric pressure. Looking at it from another point of view, it would be obvious in view of Pengilly to employ preformed ester as a solvent in the reaction of Munro et al.

On the appeal of the present application, the board stated:

With regard to the rejection under Section 103, we find ourselves in substantial agreement with the position of the examiner as set forth in his answer. The claims on appeal are in essence the same as those in Serial No. 667,854, which is now before the District Court for the District of Columbia (Civil Action 666-71), the basic difference being the involved claims recite and are limited to "commercial scale production" utilizing "commercial scale quantities." The claimed invention is otherwise identical insofar as the material limitations defined are concerned. The claims in parent case Serial No. 667,854 were rejected under Section 103 over the same art applied herein and essentially for the same reasons. Insofar as the question of whether or not the combination of the teachings of Pengilly and Munro et al would render the claimed process prima facie obvious, the same arguments were presented by appellant and the examiner in both the prior case and herein. Based on these arguments, the Board of Appeals agreed with the position of the examiner and affirmed the rejection. Appellant has set forth no good and sufficient reason why we should reconsider the prior Board decision or reach any other conclusion based on the arguments alone; we therefore adhere to that position and adopt it as our own.

The only remaining question for this Board to consider with regard to the Section 103 rejection is whether or not the affidavit filed under the provisions of Rule 132 is sufficient to rebut the prima facie case: in our opinion, it is not.

[4] The board erred in adopting the earlier opinion. The basis for evaluation and for decision had changed. The present board had before it not only the application and the prior art but all of the unrebutted facts established in Rinehart's affidavit. At that stage no question of prima facie obviousness remains. The appealed claims must be reconsidered in the light of all the evidence, and the resultant finding, that the claimed invention would or would not have been obvious, is to be made in such light.

[5] The concept of rebuttable prima facie obviousness is well established. Cf. In re Freeman, 474 F.2d 1318, 177

USPQ 139 (CCPA 1973); In re Klosak, 59 CCPA 862, 455 F.2d 1077, 173 USPQ 14 (1972); In re D'Ancicco, 58 CCPA 1057, 439 F.2d 1244, 169 USPQ 303 (1971). It is not, however, a segmented concept. When prima facie obviousness is established and evidence is submitted in rebuttal, the decision-maker must start over. Though the burden of going forward to rebut the prima facie case remains with the applicant, the question of whether that burden has been successfully carried requires that the entire path to decision be retraced. An earlier decision should not, as it was here, be considered as set in concrete, and applicant's rebuttal evidence then be evaluated only on its knockdown ability. Analytical fixation on an earlier decision can tend to provide that decision with an undeservedly broadened umbrella effect. Prima facie obviousness is a legal conclusion, not a fact. Facts established by rebuttal evidence must be evaluated along with the facts on which the earlier conclusion was reached, not against the conclusion itself. Though the tribunal must begin anew, a final finding of obviousness may of course be reached, but such finding will rest upon evaluation of all facts in evidence, uninfluenced by any earlier conclusion reached by an earlier board upon a different record.

[6] The board's analytical process appears to have resulted, at least in part, from Rinehart's erroneous argument that the mere inclusion of "commercial scale production" and "commercial scale quantities" served to patentably distinguish the appealed claims over those in the parent application. In response, the board engaged in comparison of the two sets of claims and \*148 emphasized their essential identity. Whether engendered by Rinehart's arguments, the concentration on the "inherent obviousness" of scaling up led Rinehart and the solicitor into error.

[7] Rinehart erred in contending that the mere insertion into the claims of "commercial scale," without more, would constitute a distinguishing limitation. Though inclusion of the phrase in the claims does no harm, it is clear that mere scaling up of a prior art process capable of being scaled up, if such were the case, would not establish patentability in a claim to an old process so scaled. Moreover, absent evidence to the contrary, nothing in Pengilly or Munro indicates that their processes are not effective on a commercial scale, and Rinehart concedes that commercial operation is implicit in the reference patents.

Rinehart argues here that merely because the appealed claims include a "crucial limitation" to commercial quantities, they were "different claims" and that the board could not therefore have applied the earlier decision to

them. We cannot agree. Absent the evidence in Rinehart's affidavit, use of commercial quantities in the processes of the references would have been obvious. If all Rinehart had done was to add the broad "commercial scale" phrases, the board's treatment would have been correct. It could not have found that the mere use of commercial quantities established unobviousness of the invention as a whole. But Rinehart did more. He submitted substantial evidence touching the basic question of whether his claimed process would have been obvious.

The board erred, as above indicated, in comparing the appealed claims to the earlier claims as though it had been established that the latter did in fact set forth an old or obvious process. In such comparison, the board proceeded as though the earlier claims were a kind of prior art to Rinehart and as though the earlier decision on those claims was a kind of res judicata. The differences between the two sets of claims were simply not at issue in this case. The sole question is whether Rinehart's claimed process would have been obvious in view of all the evidence.

#### *The Evidence*

The opinion of the board on the appeal involving the parent application included the following:

Appellant alleges the existence of numerous difficulties with the processes of Pengilly and Munro et al. which, he claims, are overcome by combining the features of both processes. However, appellant's allegations are not supported by any evidence.

[8] The evidence now of record, in our view, does support Rinehart's allegations. The assertion that the processes of Pengilly and Munro cannot satisfactorily be scaled up is neither challenged nor rebutted. Though mere reference to "commercial scale quantities" in the claims and affidavit does not itself establish patentability, it does establish the environment of the invention. It outlines the problem solved and gives dimension to Rinehart's contribution. The claims must therefore be considered, and the references must be evaluated, in the light of an effort to achieve commercially effective production. As will appear hereinbelow, the affidavit evidence also spotlights portions of the prior art disclosures indicating unobviousness of the claimed process.

It is true that Pengilly and Munro both disclose processes for polyester production by direct esterification. Rinehart's affidavit admits that he began with an effort to employ the process of Pengilly on a commercial scale and that the only essential difference between the claimed process and that of Pengilly is the employment of

superatmospheric pressure.

The board adopted the earlier opinion, which considered the claimed process as either that of Pengilly with the substitution of the superatmospheric pressure disclosed by Munro or that of Munro with the use of a preformed polyester as disclosed by Pengilly. But that view of the claimed process does not end the inquiry. The question remains whether it would have been obvious, in scaling up Pengilly's process, to have employed Munro's higher pressures or in scaling up that of Munro to have employed Pengilly's preformed polyester.

[9] The tribunals below did not meet the requirement of establishing some predictability of success in any attempt to combine elements of the reference processes in a commercial scale operation. As in In re Naylor, 54 CCPA 902, 369 F.2d 765, 152 USPQ 106 (1966), we find nothing in the record which would lead one of ordinary skill to anticipate successful production on a commercial scale from a combination of such elements, without increase in glycol-acid ratio. The record in fact reflects the contrary. The view that success would have been "inherent" cannot, in this case, substitute for a showing of reasonable expectation of success. Inherency and obviousness are entirely different concepts. In re Spormann, 53 CCPA 1375, 363 F.2d 444, 150 USPQ 449 (1966); In re Adams, 53 CCPA 996, 356 F.2d 998, 148 USPQ 742 (1966).

\*149 The board cited the indication in both Pengilly and Munro that their processes led to rapid reaction time and concluded that improved reaction time would be expected if elements of those processes were combined. The evidence of record establishes, however, that reaction times of both prior processes lengthen as the processes are scaled up.

The board held the view that Munro's teaching of higher pressures to increase reaction rate would have provided an obvious solution to the problem Rinehart encountered in scaling up the process of Pengilly. But Rinehart's problem was not the need for increased reaction rate. It was, as the evidence established, the existence of lumps of frozen polymer. That problem is nowhere alluded to in either Pengilly or Munro, and of course no suggestion of a solution appears in either reference.

Moreover, Pengilly suggested that superatmospheric pressure was productive of certain disadvantages, particularly the need for use of a "large excess" of glycol. The use of superatmospheric pressure in a direct esterification process was referred to in other prior patents of record. With the exception of Munro, however, each such reference cited disadvantages of its use or an

inability to find it workable. Munro's disclosure of superatmospheric pressure is rendered an abstraction with respect to appellant's problem by Munro's indication of the same excess glycol requirement when a large scale operation is contemplated. Munro employs a large excess of glycol (a ratio of glycol to acid of 3:1) in his example 5, the only example devoted to larger scale production. Rinehart's large scale production process is limited to a substantially equimolar ratio of glycol to acid. In view of all of the evidence, we cannot agree that Munro would suggest to one skilled in the art the use of superatmospheric pressure to solve the problem of scaling up the process of Pengilly.

Similarly, we find no suggestion in Pengilly or in Munro that Pengilly's preformed ester be employed in Munro's process to overcome the problems encountered in scaling up the process of Munro. Munro, as co-inventor with Lewis in earlier British Patent No. 776,282, was familiar with the use of a preformed polyester in direct esterification, yet neither Munro nor his co-inventor Maclean suggested its use with superatmospheric pressure in the cited reference. We find that the Munro patent contains its own solution to large scale operation, i.e., the use of excess glycol referred to above. That solution is not employed by appellant.

[10] Absence of any suggestion in either Pengilly or Munro that features of the process of one should be combined with features of the other to achieve the commercial scale production of which neither is capable requires a holding that the rejection herein was improper. In re Avery, 518 F.2d 1228, 186 USPQ 161 (CCPA 1975). In view of that holding, it is unnecessary to consider Rinehart's allegations of commercial success and satisfaction of long-felt need.

The decision of the board is reversed.

FN1 The present application is a continuation-in-part of application serial No. 667,854 (parent), filed September 14, 1967, which in turn is a continuation-in-part of application serial No. 254,754, filed January 29, 1963, both of which are now abandoned. Prior to the present appeal, the rejection of parent application was appealed to the U.S. District Court for the District of Columbia. Goodyear Tire & Rubber Co. v. Schuyler, Com'r., Civil No. 666-71 (D.D.C., Feb. 25, 1975). Upon stipulation, that action was dismissed with prejudice, after the express abandonment of the parent application, but without prejudice to the allowance of materially different claims, or of the same or similar claims on a record supporting them, such as the record

now before us.

FN2 The solvent may include stabilizer, catalyst, and ether inhibitors.

FN3 U.S. Patent No. 3,427,287 issued February 11, 1969.

FN4 U.S. Patent No. 3,050,533 issued August 21, 1962.

FN5 The board also affirmed a double patenting rejection of those claims under 35 USC 101 based upon the copending parent application. Express abandonment of the parent application, subsequent to the board's decision, moots the issue.

FN6 The earlier board also speculated that Munro's continuous process may "actually involve the use of preformed ester as the reaction solvent if the reaction takes place throughout the reactor and if, during the initial part of the process, the product is not withdrawn as rapidly as it is formed."

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